~~(2)(b)~~ Test medium used. ~~(3)(c)~~ Test pressure. ~~(4)(d)~~ Test duration. ~~(5)(e)~~ Pressure recording charts, or other record of pressure readings. ~~(6)(f)~~ Elevation variations, whenever significant for the particular test. ~~(7)(g)~~ Leaks and failures noted and their disposition. (b) Each operator must maintain a record of each test required by §§ 192.509 [test requirements for pipelines to operate below 100 psi gage], 192.511 [test requirements for service lines], and 192.513 [test requirements for plastic pipelines] for at least 5 years.	• This rule "would not require operators to obtain copies of records kept by their customers' contractors. No matter who does the testing, its own workers or its customers' contractors, operators would only have to verify that correct leak tests have been done and then record that fact. Under part 192, distribution operators are already responsible for the correct installation and leak testing of customer-owned service lines. Operators who do not install and test customer-owned service lines themselves must still verify that work done by their customers' contractors meets part 192 requirements." 68 Fed. Reg. 53,898. • "The proposed rule would apply to leak tests done after the rule takes effect," 67 Fed. Reg. at 68,822.
§ 192.553 Uprating: General requirements **Revised Regulatory Language:** (a) *Pressure increases* (b) *Records* (c) *Written plan* (d) *Limitation on increase in maximum allowable operating pressure.* Except as provided in § 195.555(c), a new maximum allowable operating pressure established under this subpart may not exceed the maximum that would be allowed under ~~this part~~ §§ 192.619 and 192.621 for a new segment of pipeline constructed of the same materials in the same location. However, when uprating a steel pipeline, if any variable necessary to determine the design pressure under the design formula (§ 192.105) is unknown, the MAOP may be increased as provided in § 192.619(a)(1).	**Reasons for Revision:** • §§ 192.619 and 192.621 limit the MAOP of new pipelines • OPS characterized this modification as a simple editorial change. 68 Fed. Reg. 53,898.

§ 192.605(b)(11) Procedural manual for operations, maintenance, and emergencies **Revised Regulatory Language:** (a) *General* [unchanged] (b) *Maintenance and normal operations*. The manual required by paragraph (a) of this section must include procedures for the following, if applicable, to provide safety during maintenance and operations. . . . . (11) Responding promptly to a report of a gas odor inside or near a building, unless the operator's emergency procedures under § 192.615(a)(3) specifically apply to these reports.	**Reasons for Revisions:** • OPS explained that this modification is intended to ensure operators have adequate procedures for responding promptly to gas odor reports. 67 Fed. Reg. at 68,822.
§ 192.625(f) Odorization of gas **Revised Regulatory Language:** (f) ~~Each operator shall conduct periodic sampling of combustible gases to assure the proper concentration of odorant in accordance with this section.~~ To assure the proper concentration of odorant in accordance with this section, each operator must conduct periodic sampling of combustible gases using an instrument capable of determining the percentage of gas in air at which the odor becomes readily detectable. Operators of master meter systems may comply with this requirement by – (1) Receiving written verification from their gas source that the gas has the proper concentration of odorant; and (2) Conducting periodic "sniff" tests at the extremities of the system to confirm that the gas contains odorant.	**Reasons for Revisions:** • This provision now specifically provides that an instrument must be used to determine odorant concentration. 67 Fed. Reg. at 68,823. • OPS decided to establish a minimum sampling frequency. Id.

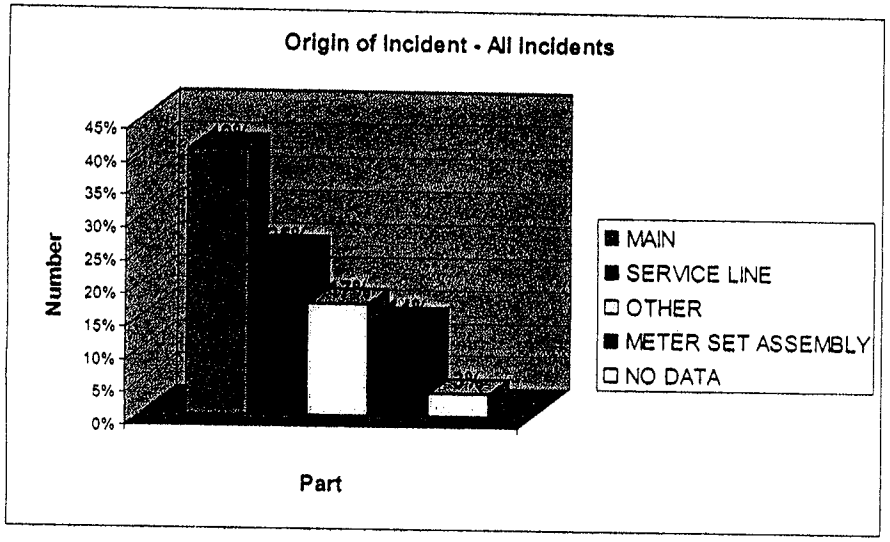
§ 192.739(c) Pressure limiting and regulating stations: Inspection and testing **§ 192.743 Pressure limiting and regulating stations: Capacity of relief devices** **Revised Regulatory Language (§ 192.739(c)):** Each pressure limiting station, relief device (except rupture discs), and pressure regulating station and its equipment must be subjected at intervals not exceeding 15 months, but at least once each calendar year, to inspections and tests to determine that it is – . . . . (c) ~~Set to function at the correct pressure~~ Set to control or relieve at the correct pressures consistent with the pressure limits of § 192.201(a); and **Revised Regulatory Language (§ 192.743):** (a) ~~If feasible, pressure relief devices (except rupture discs) must be tested in place, at intervals not exceeding 15 months, but at least once each calendar year, to determine that they have enough capacity to limit the pressure on the facilities to which they are connected to the desired maximum pressure.~~ Pressure relief devices at pressure limiting stations and pressure regulating stations must have sufficient capacity to protect the facilities to which they are connected consistent with the pressure limits of § 192.201(a). This capacity must be determined at intervals not exceeding 15 months, but at least once each calendar year, by testing the devices in place or by review and calculations. (b) ~~If a test is not feasible, review and calculation of the required capacity of the relieving device at each station must be made at intervals not exceeding 15 months, but at least one each calendar year, and these required capacities compared with the rated or experimentally determined relieving capacity of the device for the operating conditions under which it works. After the initial calculations, subsequent calculations are not required if the review documents that parameters have not changed in a manner which would cause the capacity to be less than required.~~ If review and calculations are used to determine if a device has sufficient	**Reasons for Revisions:** • The modification to § 192.743(a) & (b) will permit operators to use calculations to decide if the capacity of relief devices is adequate without first having to conclude that testing the devices is not feasible. 67 Fed. Reg. at 68,823; 68 Fed Reg. at 53,898.

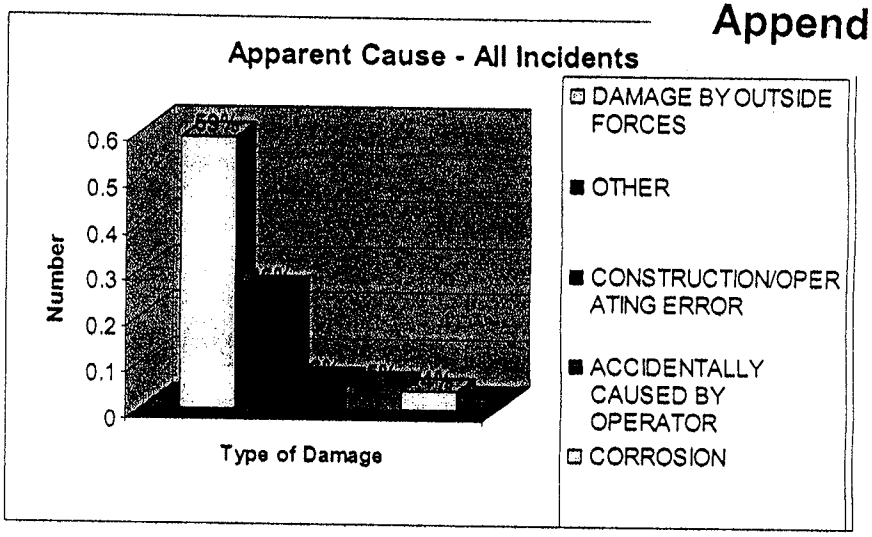
capacity, the calculated capacity must be compared with the rated or experimentally determined relieving capacity of the device for the conditions under which it operates. After the initial calculations, subsequent calculations need not be made if the annual review documents that parameters have not changed to cause the rated or experimentally determined relieving capacity to be insufficient. (c) If ~~the relieving~~ a relief device is of insufficient capacity, a new or additional device must be installed to provide the ~~additional~~ capacity required by paragraph (a) of this section.	• In response to a comment that OPS should permit operators the option of modifying existing devices or associated facilities to provide the required relief capacity, OPS stated that it does not "interpret § 192.743(c) to require the installation of unnecessary relief devices. If operators provide adequate relief capacity by modifying existing relief devices or associated facilities, new or additional devices are not necessary." 68 Fed. Reg. 53,898.
§ 192.745 Valve maintenance: Transmission lines **Revised Regulatory Language:** (a) Each transmission line valve that might be required during any emergency must be inspected and partially operated at intervals not exceeding 15 months, but at least once each calendar year. (b) Each operator must take prompt remedial action to correct any valve found inoperable, unless the operator designates an alternative valve.	**Reasons for Revision:** • OPS did not adopt NAPSR's recommendation that operators take "immediate" remedial actions to correct inoperable valves. OPS requires "prompt" action to allow operators some latitude in scheduling maintenance. • OPS declined to establish a time limit for "prompt" remedial action. OPS noted, however, that operators can reduce disagreements with government inspectors over the meaning of the word "prompt" by assigning priority to inoperable emergency valves in their repair schedules. "Operators can also look to their experience in promptly correcting corrosion control deficiencies under § 195.465(d). OPS decided not to establish a time limit for "prompt remedial action" because it could promote unnecessary delay and erode the latitude operators need in scheduling repairs." 68 Fed. Reg. 53,898-99. • OPS explained that the rule preserves existing operator latitude to designate an equivalent alternative valve rather than repair an inoperable valve.

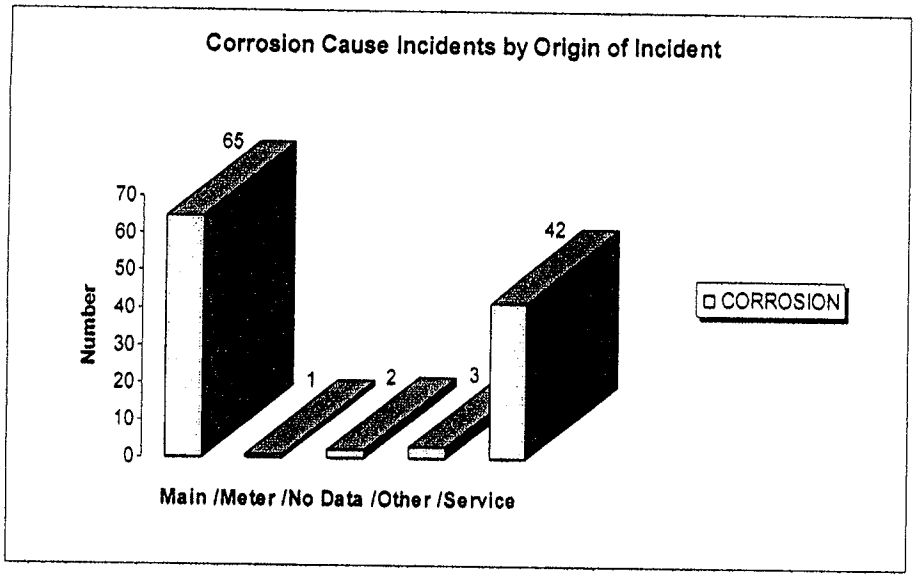
§ 192.747 Valve maintenance : Distribution systems **Revised Regulatory Language:** (a) Each valve, the use of which may be necessary for the safe operation of a distribution system, must be checked and serviced at intervals not exceeding 15 months, but at least once each calendar year. (b) Each operator must take prompt remedial action to correct any valve found inoperable, unless the operator designates an alternative valve.	**Reasons for Revision:** • See discussion of § 192.745. • OPS rejected the suggestion that it require prompt remedial action for inaccessible valves. Rather, OPS explained, "if a designated valve becomes inaccessible, usually because of paving, the operator should discover the problem no later than the next inspection. Then the operator would have to either correct the problem to enable inspection within the permitted interval or designate an alternative safety valve." OPS also believes that the problem if inaccessible valves is adequately addressed by § 192.605(b)(1) which requires distribution operators to have and follow procedures to carry out the safety valve maintenance requirements of § 192.747. 67 Fed. Reg. at 68,824; 68 Fed Reg. at 53,899.
§ 192.753 Caulked bell and spigot joints **Revised Regulatory Language:** (a) Each cast iron caulked bell and spigot joint that is subject to pressures of more than 25 psi (172 kPa) gage or more must be sealed with: . . . (b) Each cast iron caulked bell and spigot joint that is subject to pressures of ~~less than~~ 25 psi (172 kPa) gage or less and is exposed for any reason must be sealed by a means other than caulking.	**Reasons for Revision** • This change eliminates a conflict between §§ 192.621(a)(3) and 192.753(a).

Summary of DOT Incident Reports 1985 – 2003 (Form RSPA 7100.1)

Appendix 8







- **Total Incidents in database is 2715 as of 4-13-03**
- **Incidents with "Apparent Cause" classified as corrosion is 113**
- **Total Corrosion Apparent Cause with the origin of the incident on the "Meter Set Assembly" is 1**

1. GENERAL

Appendix 9

The following is the established procedure for leakage surveys, leak classification, action criteria, and reporting. When evaluating any gas leak, the initial step is to determine the perimeter of the leak area. When the perimeter extends to a building wall, the investigation will continue into the building.

2. DEFINITION OF TERMS

a. **Building:** Any structure, which is normally or occasionally entered by humans for business, residential or other purposes, and in which gas could accumulate.

b. **Building of Public Assembly:** A building where persons would gather for a public event. These buildings would include schools, churches, hospitals, theaters, etc.

c. **Business District:** Areas with wall-to-wall paving and/or where the principal commercial activity of the city or town takes place.

d. **Class Locations:** An area defined and classified by set criteria included in D.O.T. Pipeline Safety Regulations, CFR Title 49 part 192.5.

e. **Combustible Material:** A flammable gaseous material consisting of organic compounds such as methane, benzene, etc.

f. **Confined Space:** A confined space means any space which has a limited means of access and egress, has adequate size and configuration for employee entry, is not designed for continuous employee occupancy and where the atmosphere may be deficient in oxygen content or is subject to the accumulation of toxic or flammable contaminants.

g. **Distribution Main:** A line that serves as a common source of gas supply for more than one service line.

h. **Gas Detector:** An instrument capable of detecting and measuring the percentage concentration of combustible gas in air.

i **Gas Facilities:** All company operated gas lines and related appurtenances.

j. **Leak:** The unintentional escape of gas from containment.

k. **Leak Classifications:**

(1) Class 1 Leak - A leak which represents an existing hazard to persons or property requiring immediate repair or continuous action until conditions are no longer hazardous.
(2) Class 2 Leak - A leak, which is recognized as being non-hazardous at the time of detection, but requires periodic monitoring based on possible future hazard.
(3) Class 3 Leak - A leak that is non-hazardous at the time of detection and can be reasonably expected to remain non-hazardous.

l. **Leak Survey:** A search for possible gas leakage in any area where gas facilities exist, or where a gas leak is reported or suspected.

m. **LEL:** The lower explosive limit, as indicated on a combustible gas indicator, expressed as a percentage of gas in air.

n. **Reading:** A repeated measure of gas indicated on a gas detector. Where the reading is in a confined space, consideration should be given to the rate of dissipation when the space is opened or ventilated for the test and the rate of accumulation when the space is closed.

o. **Service Line:** A distribution line which transports gas from a common source of supply to a customer meter.

p. **Station Piping:** For the purposes of leak surveying, this includes all underground gas pipes and appurtenances within the property lines of regulator stations and other gas operating installations.

q. **Substructure:** Any man-made structure, tunnel, passageway, or other confined space below ground level where gas could accumulate.

3. PRIORITIES

a. Surveillance and repair activities shall be based on such factors as:

(1) The volume, gas-air concentration, and source of the escaping gas.
(2) The size and occupancy of the area where the leakage could occur, and the proximity to structures both above and below ground.
(3) The presence of any substructure or other underground facility that could affect the migration or accumulation of gas.
(4) Soil or surface conditions that could affect the migration of gas.
(5) The proximity to sources of ignition.
(6) Public awareness and reaction to the leak situation.
(7) Soil movement caused by landslides, earthquakes, etc., where external stresses on the pipeline may cause leakage.

3. PRIORITIES

b. After consideration of the above factors, repair priority will be in the order of Class 1, Class 2, and Class 3.

4. LEAK CLASSIFICATION AND ACTION CRITERIA

The following examples of leak conditions and possible action are to be used as guidelines and are not exclusive.

The judgement of company personnel at the scene is of primary importance in determining the classification of a leak and the action to be taken.

a. Class 1 - Classification

(1) Any leak which, in the judgement of company personnel at the scene, is regarded as an immediate hazard.
(2) Any indication of gas, which has migrated into or under a building or structure.
(3) Any reading below ground or which has emanated from below ground at the outside wall of a building.
(4) Escaping gas, which has ignited.
(5) Any reading of 80% LEL, or greater, in a confined space.
(6) Any reading of 80% LEL, or greater, in a non-gas substructure from which gas would likely migrate to the outside wall of a building.
(7) Any reading of 40% LEL, or greater, under a sidewalk which extends to a building wall in wall-to-wall paved area.

b. Class 1 - Action Criteria

Take immediate and continuous action until the hazard no longer exists. Such action may include (but is not limited to or restricted to the order in which they are listed) one or more of the following:

(1) All identified conditions of a hazardous nature to persons or property shall be promptly made safe and permanent repairs instituted.
(2) Evacuate the premises and notify the area Manager or Director of the situation.
(3) Vent the leakage.
(4) Remove sources of ignition.
(5) If burning, prevent the spread of the fire but not necessarily extinguishing burning gas.
(6) Eliminate the source of gas by closing valves or other means.
(7) Restrict public access into the area, including rerouting traffic.

(8) Notify police and fire departments.
(9) If the hazard cannot be rectified, refer to OM-62.

c. **Class 2 - Classification**

(1) Any leak which, in the judgement of company personnel at the scene, is of sufficient magnitude to justify periodic monitoring.
(2) Any leak which, under frozen or other adverse soil conditions, would likely migrate to the outside of a building wall.
(3) Any leak under the street of a wall-to-wall paved area that has a substantial enough spread to indicate the possibility of migrating to the outside wall of a building.
(4) Any reading between 20% LEL and 80% LEL in a confined space.
(5) Any reading between 20% LEL and 80% LEL in a non-gas substructure.
(6) Any reading on a pipeline operating at 20% SMYS, or greater, in a Class 3 or 4 location.

d. **Class 2 - Action Criteria**

Monitor on a periodic basis, the frequency depending on the location and magnitude of the leak. Schedule repair as necessary.

e. **Class 3 - Classification**

All other leaks which are determined to be non-hazardous at the time of detection and can be expected to remain non-hazardous.

f. **Class 3 - Action Criteria**

Reevaluate during next scheduled survey or until leak is reclassified or no longer results in a reading.

5. FREQUENCY OF PERIODIC LEAK SURVEYS

a. **Monthly Survey**

In accordance with the Massachusetts Department of Telecommunications and Energy Order 93-199, dated March 29, 1994, a leak survey of the high pressure pipeline to the Massachusetts Institute of Technology (Third Street to Albany Street, Cambridge) must be conducted monthly.

b. **Quarterly Survey**

Mains in place or on structures where anticipated movement or external loading could cause failure or leakage will be surveyed at intervals not exceeding 4½ months, but at least four times per calendar year [Ref. 192.72 1 (b)].

During these surveys observations will be made of surface conditions on and adjacent to the pipeline right-of-way for indications of leaks, construction activity, and other factors which may affect safety and operation.

c. **Annual Survey**

(1) Business district - A gas detector survey will be conducted at intervals not exceeding one year in business districts including tests of the atmosphere in gas, electric, telephone, sewer, and water system manholes, at cracks in pavement and sidewalks, boxes including gas boxes, and at other locations providing an opportunity for finding gas leaks.

In areas where effectively prescribed and supervised surveys of manholes (electric, telephone, etc.) and vaults is conducted and offers more frequent coverage. Such a survey procedure may be substituted.

The business districts shall be outlined on a map. The map shall be revised as conditions warrant. [Ref. 192.723 (b)(I) ; 220 CMR 101.06 (21)(a)]

(2) Buildings of Public Assembly - A survey will be conducted at least once annually and shall include tests for gas leakage and visual inspection of gas facilities in the immediate area of the service entrance. [Ref. 220 CMR 101.06 (21)(d)]

(3) Mains Operating At A Hoop Stress of 20% SMYS - Leakage surveys of mains operating at a hoop stress at or above 20% SMYS shall be made at intervals not exceeding 15 months, but at least once each calendar year. [Ref. 192.706 (b)]

The following is a list of mains with a hoop stress of 20% SMYS or greater at MAOP:

CAMBRIDGE

(a) J-2 Lateral, McGrath Hwy, Somerville to Third St., Cambridge

MAOP: 329 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 219 p.s.i.g

HOPCO

(a) LNG plant to Wilson Street meter station, Hopkinton

MAOP: 1000 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 445 p.s.i.g

(b) Marathon Station, inlet side

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 611 p.s.i.g

(c) TGP inlet to Marathon Station

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 462 p.s.i.g

(d) TGP/AGT Marathon Station outlet to Wilson Street meter station, Hopkinton

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 462 p.s.i.g

(e) AGT inlet to Marathon Station

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 611 p.s.i.g

(f) Marathon Station, to LNG plant

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 710 p.s.i.g

SOUTHBORO/WORCESTER

(a) Hopkinton-Ashland Transfer Line, Wilson Street, Hopkinton to Pond St. Ashland

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 611 p.s.i.g

d. **Every Two Years**

(1) Areas not included in business districts. [Ref. 220 CMR 101.06 (21)(b)]
(2) Service stubs shall be identified and a leakage survey made at least once every consecutive twenty-four (24) month period using a gas detector system, such as flame ionization equipment or equivalent devices. [Ref. 220 CMR 107.07 (2)]

e. **Every Three Years**

Cathodically unprotected metallic distribution lines, which are located outside business districts and are subject to D.O.T. Pipeline Safety Regulations part 192.465(e) on which electrical surveys are impractical.

f. **Every Five Years**

All other service lines not covered in Section 5, Items a to e, will be surveyed at intervals not exceeding five years. This survey will include 20% of the service lines each year. Persons participating in leakage surveys shall be trained to recognize the possible existence of locations of unknown or unidentified leaking inactive service lines that may be found during the survey. (This will also apply to item 4 above.) [Ref. 220 CMR 107.07 (1)]

g. **Additional Leak Surveys**

The following is to be used as a guide for conducting additional leak surveys as frequently as experience and technology indicate necessary:

(1) Surveys during winter months when frost heave could result in leakage.
(2) Yearly survey in lieu of two year survey of entire distribution system in addition to the principal business districts. This survey may be performed at a faster rate than the two year survey. It may involve driving in the normal traffic lanes on both sides of the street.
(3) Survey of commercial buildings to include tests for gas leakage and visual inspection of gas facilities in the immediate area of the service entrance.

(4) Manhole surveys outside the business district.
(5) Interim patrols to locate leaks after or during outside construction in the area of gas lines, prior to street resurfacing, and as a result of past leak history or corrosion information.
(6) Pipeline patrols - Refer to OM-78.

6. LEAK SURVEY METHODS

a. The method used for leakage surveys shall include one or more of the following:
(1) Gas detector survey using combustible gas indicators
(2) Flame ionization equipment
(3) Infrared equipment
(4) Other industry accepted and proved equipment

b. When conducting scheduled surveys the following guidelines will be observed unless otherwise directed:

(1) Mobile surveys will be performed with a mobile unit at a speed of not more than 5 MPH. The detection instrument will be set on the low scale (0-10 PPM). The survey will be conducted on both sides of the street wherever possible.
(2) Walking surveys will be performed using a portable flame ionization unit, or other industry accepted equipment, walking in the sidewalk area parallel to the main and along the foundation of the building, and crisscrossing the land between the main and the structure. In the case of a vacant lot, the same pattern will be followed using common sense to establish a bound area. The probe of the instrument will be held as close to the ground as possible while walking. This survey shall encompass all buildings and lots on a given street unless otherwise noted.
(3) Building surveys will include tests for gas leakage and visual inspection of the gas facilities in the immediate area of the service entrance. Tests will be conducted with a combustible gas indicator or other industry accepted equipment.
(4) Bridge and other exposed pipe surveys will be performed by walking the designated areas using a portable flame ionization unit or other industry accepted equipment. While conducting the survey the detection probe will be placed as close to the pipe as possible.
(5) Surveys conducted in a principal business district will involve the testing of the atmosphere in available street openings including electric, telephone, sewer, drain, and water system manholes, catch basins, at cracks in pavement and sidewalks, boxes including gas boxes, and at other locations providing the opportunity for finding gas leaks. These tests will be performed using a combustible gas indicator, flame ionization equipment, or other industry accepted equipment.

(6) Outside surveys will not be performed during wind or weather conditions, which would adversely affect the ability of the survey unit to accurately detect the presence of leaks.
(7) When the person conducting a scheduled survey detects any leak determined to be potentially hazardous and classified as a Class I, they will immediately notify the appropriate personnel and remain at the location of the leak. This person will continue to pinpoint the source of the leak until properly relieved by a supervisor.

7. FOLLOW-UP INSPECTION

The adequacy of leak repairs will be checked before backfilling. The perimeter of the leak area will be checked with a combustible gas indicator. Where there is residual gas in the ground after the repair of a Class 1 leak, a follow-up inspection will be made as soon as practical after allowing the soil atmosphere to vent and stabilize, but in no case later than one month following the repair. In the case of other leak repairs, the need for a follow-up inspection will be determined by qualified personnel.

In order to facilitate a follow-up inspection, the amount of residual gas from a Class I leak must be recorded on the reverse side of Leakage Control Report OD 374.

8. RECORDS

a. Leak survey records for mains operating at or above 20% SMYS must be kept as long as the segment involved remains in service. [Ref. 192.709]

b. All other leak survey records identified in this operating and maintenance plan must be kept on file for a period of time not less than the interval between successive surveys. [Ref. 220 CMR 101.06 (21)(f)]

c. Each leak survey record shall include sufficient information to determine the following at a later date:

(1) The type of survey and date it was conducted.
(2) The personnel conducting the survey and whom they represent.
(3) The area or buildings surveyed.
(4) Location of all leak indications found.

d. In the event of a leak, the person conducting the survey will complete Leakage Control Report OD 374. In addition to the above information the following will be recorded:

(1) The method of survey.
(2) The percent of gas or LEL.
(3) The leak classification.
(4) A sketch providing the location of the underground leak or a detailed description of an above ground leak.
(5) Time reported (Class 1).

e. Leak repair records on all lines will be kept on file for as long as each segment remains in service. Each leak repair record will include:

(1) Information required on the reverse side of Leakage Control Report OD 374 (see attached).
(2) Person responsible for repair.
(3) A sketch of the exact location of the repair and any other pertinent information regarding underground leaks.
(4) Description of repairs made on above ground leaks.
(5) Method used to repair the leak.
(6) Percentage of residual gas after the repair of a Class I leak.

9. OTHER COMBUSTIBLE MATERIAL IN SOIL

If the source of the gas leak can not be found after a thorough investigation by a Leak Surveyor or by a Distribution Crew, one potential cause that must be considered is the presence of other combustible material in the soil.

Once it has been determined the source of the combustible material in the soil is not from our facility, the appropriate public safety office will be notified.

§192.603 General provisions.

(a) No person may operate a segment of pipeline unless it is operated in accordance with this subpart.

(b) Each operator shall establish a written operating and maintenance plan meeting the requirements of this part and keep records necessary to administer the plan.

§192.605 Essentials of operating and maintenance plan.

Each operator shall include the following in its operating and maintenance plan;

(a) Instructions for employees covering operating and maintenance procedures during normal operations and repairs.

(b) Items required to be included by the provisions of Subpart M of this part.

(c) Specific programs relating to facilities presenting the greatest hazard to public safety either in an emergency or because of extraordinary construction or maintenance requirements.

(d) A program for conversion procedures, if conversion of a low-pressure distribution system to a higher pressure is contemplated.

(e) Provision for periodic inspections to ensure that operating pressures are appropriate for the class location.

Information Request PESD-10

Please provide any and all documents in support of your reply to the NOPV, D.T.E. 03-PL-19 in which NSTAR Gas Company disputes the alleged violations contained in the NOPV pursuant to 220 C.M.R. § 69.04(1)(d).

Response

The Company included all significant materials relied on to support its reply to the Division's NOPV in the response submitted to the Department on December 10, 2003 (which was reproduced in response to Information Request PESD-9).

In addition, the following exhibits to the Department's Incident Report dated November 6, 2003 support the Company's response to the NOPV:

1. Exhibit 19 (photograph of pressure gauge showing a test pressure of 58 psig);
2. Exhibit 20 (Summary Table of NSTAR Gas visits to 65 Main Street, Hopkinton);
3. Exhibit 21 (Walking Leak Survey, January 10, 2002);
4. Exhibit 22 (Mobile Leakage Survey, July 2, 2002);
5. Exhibit 23 (Business District Survey, July 15, 2002); and
6. Exhibit 24 (Odorant Reports from NSTAR Gas, January through August 2002 and odorant test taken July 24, 2002 in the area of 65 Main Street).

Information Request PESD-11

Please provide all provisions of NSTAR Gas Company's written procedures required by 49 C.F.R. § 192.605 that apply to corrosion control.

Response

Please see the following procedures, which are contained in the Company's currently effective O&M Operating Manual regard regarding corrosion control:

(1) Attachment PESD-11(a), the Operations and Maintenance General Procedure OM-66 – Corrosion Control;
(2) Attachment PESD-11(b), the Operation and Maintenance Procedures for Corrosion Control;
(3) Attachment PESD-11(c), the Construction Procedure C-522 – Corrosion Control for Plastic Services – Inserts; and
(4) Attachment PESD-11(d), the Construction Procedure C-526 – Corrosion Control for Plastic Mains – Inserts.

This procedure pertains to the cathodic protection of steel mains and services.

1. Monitoring Existing Cathodic Protection Systems

Make the following minimum inspections and take action to correct any deficiencies observed.

a. Test every pipeline under cathodic protection once each calendar year and at intervals not exceeding fifteen months. Check that the pipeline cathodic protection is controlled so as not to damage the protective coating of the pipe. Exceptions to this inspection schedule are protected service lines, or a short section of protected main less than 100 feet in length. The latter must be inspected on a sampling basis at least 10% per year with the entire system inspected in each 10 year period.

b. Inspect each rectifier used for cathodic protection or other current source six times each year, at intervals not exceeding 2½ months.

c. Inspect each reverse current switch, diode, and important interference bond electrically six times each year, at intervals not exceeding 2½ months. Check the remaining interference bonds once each calendar year not exceeding intervals of fifteen months.

2. Remedial Measures for Corroded pipe

a. General

Whenever any portion of a buried pipeline is exposed, examine the pipeline for evidence of external corrosion. Take remedial action if corrosion is found. Record examination on Activity Report.

b. Cast Iron and Ductile Iron Pipe

Replace any segment of cast iron or ductile pipe in which general graphitization is found to a degree where fracture or leakage may result.

c. Distribution Lines

Replace with plastic or coated pipe and cathodically protect any section of pipe where the corrosion has reduced wall thickness to less than that required for the maximum allowable operating pressure of the pipeline, or that the remaining wall thickness is less than 30% of the nominal thickness. Repair the pipe if the corrosion area is small. This does not apply to cast or ductile iron pipe. If localized corrosion pitting is observed that may result in leakage, repair immediately or replace section of pipe.

3. Internal Corrosion Control

a. After July 31, 1972, corrosive gas may not be transported by pipeline, unless the corrosive effect of the gas on the pipeline has been investigated and steps have been taken to minimize internal corrosion.

b. Whenever any pipe is removed from a pipeline for any reason, inspect the internal surface for any evidence of corrosion. If internal corrosion is found, then investigate the adjacent pipe to determine the extent of internal corrosion. Take steps to minimize this internal corrosion by replacing the pipe, modifying the fluid or pipe surface.

4. Remedial Measures for Corroded pipe

General

Pipelines installed after July 31, 1971, that are or have any portion exposed to the atmosphere will be cleaned and either coated or jacketed with a material suitable for the prevention of atmospheric corrosion. Although the operator need not comply with this requirement if he can demonstrate by test, investigation or experience in the area of application, that a corrosive atmosphere does not exist, it is suggested that coating be undertaken.

For pipelines installed after August 1, 1971, that are or have any portion exposed to the atmosphere, the operator must determine the areas of atmospheric corrosion on the pipeline. If atmospheric corrosion is found, apply remedial measure. These areas of atmospheric corrosion on the pipeline must be cleaned to bright metal, and coated or jacketed with a material suitable for the prevention of atmospheric corrosion.

Monitoring

After meeting the requirements of General above, the operator shall, at intervals not exceeding three (3) years for onshore pipelines, reevaluate each pipeline that is exposed to the atmosphere and take remedial action whenever necessary to maintain protection against atmospheric corrosion.

5. Corrosion Control Records

General

Records and maps shall be maintained to show the location of cathodically protected piping, cathodic protection facilities, or other than unrecorded galvanic anodes installed before August 1, 1971 - and neighboring structures bonded to the cathodic protection system. These records shall be retained for as long as the pipeline remains in service. Also, the records of each test, survey, or inspection are required, in sufficient detail, to demonstrate the adequacy of corrosion control measures or that a corrosive condition does not exist.

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4.9.0 CORROSION CONTROL

Introduction

The purpose of these Standards is to provide Company and contractor personnel with corrosion control installation requirements and procedures. These standards are applicable to carbon steel, with references to copper, cast iron, wrought iron or other types of metallic structures.

The pipeline and cathodic protection facilities are to be installed so as to attain and maintain integrity of coating, and electrical isolation from foreign structures.

If conditions do not allow installation in accordance with these standards, the Corrosion Supervisor, or his representative(s), must give prior approval before alternate methods, materials and/or procedures are used.

4.9.1 COATING – BURIED STRUCTURES

The purpose of the coating is to prevent corrosion of steel structures by isolation from the surrounding environment. All steel natural gas pipelines, fittings, etc., installed subsequent to July 31, 1971 must have an external protective coating applied.

This standard describes the practices common to the application of pipe coatings, care and handling of materials, surface preparation, field joints, inspections for defects, and the handling of coated pipe prior to and during installation. Coating requirements apply during new construction, as well as routine maintenance procedures. Requirements apply to all coated pipe, and to those portions of bare steel pipe that are cleaned and prepared for tie-in or maintenance work.

Plant (mill) application and field application are considered separately. Specifications for plant applied primers and coatings are on file in the company.

Storage

- Storage of mill coated pipe must be in such a manner as to prevent coating damage. Pipe should be stockpiled with the bottom tier resting on padded skids placed at right angles to the pipe. Maximum skid spacing is 15'.

Care and Handling of Materials

- Examine material with limited storage life for deterioration prior to use, and discard or exchange for fresh material if the specified life is exceeded.
- Keep all pipe coatings free from contamination or damage prior to and during applications.
- Mark and label all pipe, cartons or containers with the name of manufacturer, product identification, and directions for application.

- Store primers in tightly sealed containers. Only that portion required for immediate use shall be drawn from containers.

- Storage must be at temperatures within manufacturer's recommended range and exposure to extreme temperatures should be avoided.

- Keep volatile and flammable primers away from open flame or other sources of ignition.

- Thoroughly mix primers prior to use and agitate during use, if required, to prevent settling.

Cold Applied Mastics

- Store materials in original containers, within temperature range as recommended by the manufacturer.

- Keep materials containing volatile and flammable solvents away from open flame or other sources of ignition.

Tapes and Wrappers

This category includes pre-formed tapes; heat applied, cold primer applied, pressure sensitive tapes, and over-wrapping or supporting materials, such as, felt, fiberglass and paper.

- Store tapes and wrappers as directed on the containers, in a dry place. Tapes should remain under cover until ready for use.

- Do not handle tapes and wrappers with hooks; do not throw from trucks. Materials showing evidences of damage or deterioration must not be used.

Field Joints

- Coated pipe sections connected by welding and/or mechanical coupling by means of valves or other underground appurtenances will be considered field joints.

Surface Preparation

- Use care when removing coatings to make tie-ins, to avoid disbonding of adjacent coating. Edges of thick film coatings must be tapered with enough of the wrapper removed to assure adhesion of the new coating to the existing coating.

- Thoroughly clean surfaces to be coated to remove all oil and grease. All dust, dirt, rust, mill scale, loose shop coating, dead primer, welding slag, slivers and burrs must be removed. Pipe surface must be free of all moisture.

Materials and Application

- Hand apply primer, when required, in a uniform coating thickness. Curing or drying time must be in accordance with manufacturer's specification.

- Use either a spiral wrap with overlap onto the new wrap and onto the intact coating, or a cigarette wrap using an overlap between wraps and onto the intact coating.

- Valves and irregular fittings should not be taped if taping will lead to voids under the tape. Instead, the following procedure is required:

- Clean the exposed metal of ALL dirt, oil, grease, rust, etc.

- Prime the surface using an acceptable primer according to manufacturer's specifications. (Delete this step if primerless mastic is to be used.)

- After the primer has dried sufficiently, apply acceptable mastic following manufacturer's specifications. Allow the mastic to COMPLETELY dry before backfill.

4.9.2 HANDLING COATED PIPE

Shipping and Storage

- Load coated pipe in rail cars or on flat bed trucks in such a manner as to prevent damage to the coating. Acceptable type padding or separators shall be utilized against the coating to prevent damage to the coating from wooden skids, steel straps or any other damaging type protrusions. Devices used to secure pipe during shipping must not cause damage to the coating, pipe, or pipe bevels.

- "Nest" coated pipe that is to be stacked so that adjacent pipe lengths bear equally against each other throughout their coated lengths, or should be sufficiently padded. Excessively high stacking of coated pipe must be avoided.

Handling Equipment

- Do not use equipment, which will damage the coating.

- Non-abrasive belt slings must be sufficiently wide and free of protruding rivets or bolts, to prevent damage to the coating.

- Skids and racks must be of sufficient width or must be padded, to prevent the edges from cutting the coating.

Installation

- String coated pipe along the job site in such a manner as to prevent damage to the coating. If the condition of the job site is such that the coated pipe would be damaged if placed directly on the ground, the pipe should be supported on skids or sand bags, sufficiently wide and/or adequately padded to prevent damage of the coating.

- Use approved support under pipe, which is not placed in the ditch immediately after the welding and coating operation.

- Remove foreign objects, which could damage the coating from the bottom of the ditch before the pipe is lowered into position. When rocks or other items cannot be removed, sufficient padding must be used to prevent damage to the coating.

- Remove from ditch and backfill material, wood pipe supports used during fabrication work and all other debris conducive to bacterial activity. Discard all unsuitable fill material such as large rocks, shot rock, stumps and cinders.

- Maintain a 12" clearance between pipelines and any foreign structure. If more than 1" clearance cannot be maintained, an insulating sleeve of sufficient tensile strength (such as formica, fiberglass, or nylon spacers) will be installed between the piping and the foreign structure.

- Inspect pipeline coating for damage or imperfection prior to lowering-in operation using methods and equipment as specified by the Corrosion Supervisor.

- Inspect coating for damage or imperfection prior to lowering-in operation when so directed by the Corrosion Supervisor, Engineering Department, or the representative(s) of either.

- All coating faults detected must be marked and repaired.

- Exercise care when lowering coated pipe into the ditch, to prevent the pipe from swinging against or rubbing on the sides of the ditch.

- Use extreme care when backfilling ditch, to prevent coating damage from rocks and similar objects. Padding or shielding material may be necessary to prevent such damage.

- Use extreme care when driving or boring coated pipe at road crossings so as to minimize coating damage.

4.9.3 COATING – ABOVE GRADE PIPING

All pipelines or portions of pipelines exposed to the atmosphere will have a suitable coating to prevent atmospheric corrosion. Because of the individual nature of these installations, specific coating recommendations must be obtained from the Corrosion Supervisor, or his representative(s).

4.9.4 TEST WIRES

Test wires are required for various corrosion control testing and monitoring after pipe installation.

The following wire types will be used unless otherwise specified:

- No. 8, 10 and/or 12 AWG stranded, and/or solid, copper with rubber or plastic type insulation
- Securely attach test wires to the pipe or structure and install in the configuration recommended.
- Securely tie test wires around the pipe so that the connection point will not be affected by any undue stress on the wires.
- Connection of test wires to pipe or structures will be of such a nature as to maintain mechanical strength and electrically continuity. Normally, the acceptable method is the Thermit weld connection. Brazing is allowed if pipeline operating pressure is less than 20% SMYS.

4.9.5 THERMIT WELDING PROCEDURE

Test wire connections to pipelines will be made by the Thermit weld method (Cadweld or Thermoweld).

The Thermit connection for STEEL should use 15-gram F-33 alloy charges. Steel and cast iron charges are NOT interchangeable.

Safety Procedures
The following safety procedures will be followed before attempting Thermit welds:

- Thermit weld equipment will be used by trained personnel only.
- Ignite Thermit weld charges by means of a flint gun.
- Use proper size Thermit weld charges for the particular application.
- Wear gloves and eye protection when igniting the Thermit weld charge.
- Keep flammables clear of the Thermit weld work area.
- Never use Thermit weld procedure in the vicinity of leaking gas.
- Keep the general public and others not involved in the Thermit weld operation, away from the vicinity of the operation.
- Store thermit weld charges in plastic containers and protected from moisture, dampness, humidity and excessive heat. These charges will be handled in the general manner of other flammables.

- Do not weld two or more wires on the same weld. When more than one Thermit connection is required, the minimum spacing shall be 4".

CAUTION: Never Thermit weld on the following as a burn through may result:

- Anodeless prefab riser
- Steel tubing
- Copper tubing

Preparation of Conductors

- Remove insulation prior to welding. Strip just enough insulation from the wire to allow the stripped end to protrude from the mold.
- Cable must be clean and dry to ensure an effective weld.
- Use an adapter sleeve when necessary to properly fit mold.

Preparation of the Pipe Surface

- Clean a 2" x 2" area to shiny metal at the desired connection point. Steel surface must be wire brushed or scraped to remove all scale, rust, grease and dirt. Do not use grinding wheel. DO NOT WIPE surface with a dirty rag or with hands. The skin contains sufficient oils to leave a film on the pipe surface, which will prevent proper bonding of the weld material.

Thermit Weld

- Do not use a damp or wet mold as it will produce a porous weld.
- Dry a damp mold by firing a charge before making the desired weld. This should be carried out with caution, as a wet or damp mold may cause the molten material to splatter.
- Place mold on cleaned pipe surface. Insert the conductor into the mold, after correctly positioning the conductor, mark conductor at the outer edge of the mold. Prior to igniting, check the marking to be sure conductor has not shifted.
- Open top of mold and insert steel disk.
- Empty powder charge into powder crucible (#15 powder charge for steel pipelines, powder charge size varies for cast iron pipe size, DO NOT USE CAST IRON POWDER CHARGES ON STEEL PIPELINES, A BURN THROUGH MAY OCCUR!!), being careful not to upset the steel disk. Tap bottom of powder cartridge to loosen all starting powder and spread evenly over welding powder. Place a small amount of starting powder on top edge of mold under cover opening for easy ignition.

- Close cover and ignite with flint gun. Jerk gun away quickly to prevent fouling. Note: When igniting powder with flint gun, the mold should be held by the long handle, to keep hands away from flash of igniting powder.

- Remove slag from the weld area after the molten metal has solidified. Give the weld a sharp blow with a 1#-3# hammer to insure its strength.

- If weld is unacceptable, repeat procedure.

- Apply mastic and tape on all exposed areas of pipe, including Thermit weld, when weld area has cooled sufficiently.

- Backfill carefully, to ensure that the lead wire and connection are not damaged. Wire at connection is now brittle and can break easily with even slight movement.

4.9.6 TYPES OF CATHODIC TEST STATIONS

Test station configurations must be installed as designed unless specific changes are approved by the Corrosion Supervisor, or his representative(s). Each type of test station will be designated and referred to by a Type Number. In all cases, sufficient wire will be left in the test box to permit testing personnel to readily extend the wires at least 12 inches above the top of the box when the cover is removed.

Insulating Fitting Test Station - Type 1

- Some buried insulating fittings should have an insulating fitting test station. Anodes may be installed with insulating fitting test stations as specified by the Corrosion Supervisor, or his representative(s).

- Some of the exceptions to the above requirement are as follows:

- On electrically isolated sections of pipe under 100' in length (offsets, short replacements, etc.),

Anodes and test stations are to be installed as directed by the Corrosion Supervisor.

Two or Three Wire Test Station - Type 2

A two-wire pipe test station will be installed when specified by the Corrosion Supervisor, or his representative(s). When specified, a third wire from the anode or anode bank will be brought into the test station and connected to one of the wires welded to the pipe using a split-bolt connector. The split-bolt connector and the third wire will be separately taped to prevent contact with each other, the box cover, or any other metal objects.

Four Wire Line Current Test Station - Type 3
A four-wire line current test station will be installed when specified by the Corrosion Supervisor, or his representative(s). This test station must be located so that NO laterals, mechanical fittings, nor services occur within its span.

Whenever more than one anode is to be installed at a single location (point ground bed), or, whenever an anode or anodes are installed at a prescribed test station location, an anode header cable will be installed. That anode header cable will terminate within a test station. The anodes will not be attached directly to the pipeline. This test station will also be installed on services, tanks, etc. as specified by the Corrosion Supervisor, or his representative(s). The anode lead shall be securely connected to the header wire with a connector. Anode lead connection procedure is as follows:

- Strip 3/4" of insulation off of the header wire, being careful not to nick or cut the wire.
- Cut any excess anode wire and strip back anode wire insulation 3/4".
- Connect wire and tighten securely.
- Clean wire insulation of all dirt and moisture for a minimum distance of 6" from splice.
- Complete splice by using thermit welding, acid-free soldering, or crimp sleeves as specified by the Corrosion Supervisor. Approved splice kits may also be used.
- Coat connectors, exposed copper wire(s), and cleaned area of insulation.
- Apply final wrapping with vinyl electrical tape.
- Install buried cable warning tape below grade and directly over the anode header cable.

Carrier and Casing Pipe Test Station - Type 1
Install a casing test station at every entry and exit point of a steel pipe through a buried metallic casing. This test station is not intended for sleeves through foundations or abutments, but for roadway or railroad crossings.

Permanent Reference Electrode
This test station will be installed as directed by the Corrosion Supervisor or his representative(s).

Zinc Grounding Cell
This test station will be installed when directed by the Corrosion Supervisor or his representative(s).

Parallel Contact Test Station
This test station will be installed when directed by the Corrosion Supervisor or his representative(s).

District Regulator Station
Main Piping Insulation
All district regulator installations will be insulated at the tie-in to the high pressure and low-pressure pipelines. Install a Type 1 test station with anode at each of these insulating joints unless directed otherwise by the Corrosion Supervisor or his representative(s).

Sensing Lines Isolation

- All sensing and control lines tied in upstream of the inlet insulator at the high pressure main, or downstream of the outlet insulator at the low pressure main, must be insulated at the main.

- All sensing and control lines that terminate above grade must be insulated at ground level, if remote sensing or remote control (telemetering) is to be used.

Anode Requirements

- Anode(s) will be installed as directed by the Corrosion Supervisor. Anodes should be installed a minimum of one foot below the pipe.

4.9.7 MAGNESIUM ANODES

Description of Anode Types
Generally, only one type of anode will be used for cathodic protection systems, typically:

- Pre-packaged, 17# magnesium

Pre-packaged magnesium anodes consist of four basic components:

- Tubular or strap steel core

- Cast magnesium outer core

- Packaged backfill consisting of ground hydrated gypsum, powdered Wyoming bentonite, and anhydrous sodium sulphate. This mixture is firmly packaged around the magnesium within a cotton cloth bag.

- Total weight of dry backfill material of a prepackaged anode shall be a minimum 25# for a 17# anode.

- An anode lead wire (typically 10' of #10 AWG single strand insulated copper) connected to the steel core with silver solder. The entire connection is insulated with electrical potting compound.

Care of Anodes

- Store and transport pre-packaged anodes in protected areas out of the weather.
- Do not drop or throw anode to the ground.
- Never carry anodes by the lead wire, when placing anodes in the excavation, carry by the outer bag or a tether.
- Caution will be taken not to damage the lead wire connection or insulation.

Installation Specification - Pre-packaged Anodes

- Install pre-packaged magnesium anodes at those locations or spacing as stipulated on field workorders.
- Each anode will normally be installed one foot deeper than the pipeline to which it is to be connected. Anodes must not be located within 1' of another (foreign) metallic structure, or so that another metallic structure is between the anode and the gas pipe.
- The hole diameter shall be such as to easily accommodate the size of the anode.
- Remove anode from cardboard box or paper bag, whichever is applicable. Special types are not to be removed from box. These will be so designated. Do not damage pre-packaging of anode backfill material. **Pre-packaged anodes should be thoroughly soaked in water at installation time.**
- Install anode into excavation.
- CAUTION: Never lower or carry an anode by the lead wire! Carry by the outer bag or a tether.
- Firmly tamp the soil around the package so that it is in intimate contact with the package.
- Route anode lead wires, installed on main pipelines, into a test station, when installing point ground bed anodes. When applicable, test station type will be specified (minimum two wire test station, Type 2, will be installed).
- Lead wires of anodes installed on services will typically be Thermit welded directly to the pipe (no test station).
- Install anode lead wire to a minimum depth of 12" when routed to a test box.
- Splice an additional length of #10 AWG insulated copper wire at those locations where the anode lead wire is not of sufficient length to make a connection.

- Splice will be made with a connector of suitable size. All strands of wire must be included in the connector to ensure that full mechanical strength and current capacity of the lead wire is maintained.

- Coat splice as stipulated in paragraph 3.10.6.

Anode Requirements

The following table is to be used for general guide for anode requirements:

Pipe Size	Length	Anode Size
3/4"	500'	#17
1.25"	400'	#17
1.5"	400'	#17
2"	400'	#17
3"	350'	#17
4"	255'	#17
6"	130'	#17
8"	110'	#17
10"	100'	#17
12"	75'	#17

- One anode for every unit length indicated or fraction thereof.

- Steel valve w/ transition fittings, or transition fittings only: one anode attached by the Thermit weld method.

4.9.8 ELECTRICAL ISOLATION

When the installation of an insulating device is specified by the Corrosion Supervisor, it shall be installed as close as possible to the tie-in point of older pipe. Above grade terminations will be insulated as close to grade level as possible and practical. The following general requirements will apply:

- When possible, test insulating unions, swivels and flange type devices by the radio frequency test method, upon installation, and prior to backfilling.

- Electrically isolate the cathodic protection system from other structures

- Electrical isolation devices will be installed as close to the tie-in location as device design and safety considerations allow.

- All service pipelines will be electrically isolated at or near the meter location.
- Generally, electrically insulating devices will be installed at the following locations:
- All meters and/or risers, and other above or below ground termination points where the cathodic protection system would be grounded to a foreign structure.
- WARNING!! Never attempt to strike an arc-weld with the welder ground wire attached to the opposite side of an insulator. This practice could seriously damage the pipeline at a remote location.

4.9.8.1 CASING - CARRIER

Any non-copper gas carrier pipe installed through a casing should be electrically insulated from the casing.

- Center the carrier pipe within the casing pipe using sufficient casing spacers. Casing spacers should be spaced according to manufacturer's specifications (typically every 15').
- Install a casing end seal at every entry and exit point, to prevent penetration of dirt or moisture into the casing.
- Verification of electrical isolation should be made by Corrosion Control personnel before any buried casing is backfilled.

4.9.8.2 FOREIGN STRUCTURE PROXIMITY

- Maintain a 12" clearance between the gas pipeline and all foreign structure crossings.
- When minimum clearance cannot be achieved, and separation is 1" or less, install an insulating spacer between the structures. Spacer may be a plastic casing insulator, fiberglass shield, or multiple layers of rockshield. A steel pad may be required to distribute forces.

4.9.8.3 BRIDGE CROSSING

Any pipeline installed across a bridge or other span type structure will be insulated from that structure by the following means, as required:

- Insulating rollers
- Fiberglass sleeves
- Casing insulators
- Other type insulators that become available

4.9.8.4 INSULATING DEVICES, TIE-IN

General locations for insulating devices are given in 8.1.10.

4.9.8.4.1 COMPRESSION FITINGS

- Pipe ends will be thoroughly cleaned as far back as the fitting will extend.
- Insulating end of fitting will be installed on older existing pipeline.
- New and existing pipelines must be properly aligned. Mis-alignment will cause fitting to fail as electrical insulator.
- Test insulator for effectiveness, when possible, by approved method. (See "Isolation Test," 3.10.8.5.)
- Clean and coat entire assembly as stipulated herein.
- Install a Type 1 Test Station.

4.9.8.4.2 FLANGE TYPE FITTING

Use double sided insulating flange kits whenever possible. Be certain that proper kit size (diameter and ASA rating) is being utilized.

New Installation

- Install a full faced, phenolic gasket between the flange faces.
- Alignment of opposing bolt holes is critical. Mis-alignment will cause fitting to fail as electrical insulator.
- Install full length insulating bolt sleeves.
- Install flange bolts with insulating washers on both sides. These washers are installed between the back of flange and the steel washers.
- Test insulator for effectiveness, when possible, by approved method. (See "Isolation Test," 3.10.8.5.)
- Clean and coat entire assembly, as stipulated herein.
- Install a Type 1 Test Station where necessary.

Existing Installation
First attempt to insulate flange can be made by assuming the existing gasket is non-conductive. The annular space between the flange faces should be cleaned as thoroughly as possible.

- Install full length insulating bolt sleeves if flange faces are aligned (opposing holes are aligned).
- Install half-length bolt sleeves if flange faces are mis-aligned (opposing holes are not aligned).
- Half length bolt sleeves will have to be used on flanged valves with stud bolts.
- Remove one bolt at a time. Install flange bolts with insulating washers on both sides (one side if half length sleeves are used). These washers are installed between the back of flange and the steel washers.
- Test insulator for effectiveness, when possible, by approved method. (See "Isolation Test," 3.10.8.5.)
- If insulator is not effective, individual bolts can be tested. If all bolts are effectively insulated, it can be assumed that the flange gasket is conductive. Install new gasket.
- Clean and coat entire assembly, as stipulated herein.
- Install a Type 1 Test Station where necessary.

4.9.8.4.3 PRE-ASSEMBLED INSULATING FLANGE FITTING

This type of fitting is typically a weld-end fitting.

- Weld fitting in place.
- Test insulator for effectiveness, when possible, by approved method. (See "Isolation Test," 3.10.8.5.)
- Clean and coat entire assembly, as stipulated herein.
- Install a Type 1 Test Station.

4.9.8.4.4 PRE-ASSEMBLED EPOXY TYPE INSULATOR

This type fitting is typically a weld-end insulator.

- Weld fitting in place.
- Do not allow any stress or strain to be placed on fitting.
- Test insulator for effectiveness, when possible, by approved method. (See "Isolation Test," 3.10.8.5.)
- Clean and coat entire assembly, as stipulated herein.
- Install a Type 1 Test Station.

4.9.8.4.5 HOT TAP INSULATOR

This type fitting is a mechanical bolt on device.

- Prepare pipe surface as recommended by manufacturer.
- Install insulating end of fitting towards pipe not intended for protection.
- Support pipe on both sides of fitting, to prevent sagging. Sagging will cause fitting to fail.
- Cut out section of pipe.
- Test insulator for effectiveness, when possible, by approved method. (See "Isolation Test," 3.10.8.5.)
- Install a Type 1 Test Station.
- Clean and coat entire assembly, as stipulated herein.

4.9.8.5 ISOLATION TEST

Whenever possible, an insulating device is to be tested upon installation. Acceptable tests are the radio frequency type test using Gas Electronics, Model 601, Insulation Checker, or a voltage differential test, using Insulphone test equipment, or equal as approved by the Corrosion Supervisor or his representative(s). Follow instructions supplied with instrument.

4.9.9 MAIN PIPELINE SYSTEMS

4.9.9.1 CORROSION CONTROL REQUIREMENTS

Requirements for insulating devices or anodes on mains will normally be submitted to the Corrosion Department during design stages. The following guidelines are listed below:

New Main Installations

- Type 1 - New steel mains, installed off of rectifier protected mains, will be designed for each specific installation.
- Type 2 - New steel mains, installed off a galvanically protected system. Installation may begin with an insulating fitting and test station if the extension or lateral is to 1500' or longer. The Corrosion Supervisor may specify additional anodes.
- Type 3 - New steel main installed off of a non-protected main
- Proposed pipeline will be insulated and protected separately when installation is off of a bare steel or cast iron pipe.
- Any new steel "replacement" pipeline, which is electrically isolated, will have anode(s) installed. If replacement is 100' in length or longer, it will also have the necessary number of Type 2 test stations installed. Test stations or insulating fittings are specified under "Types of Cathodic Protection Test Stations", Part 3.10.6.

4.9.9.2 MAGNESIUM ANODE INSTALLATION

Anodes are installed clustered along the pipeline as point ground beds. When installation of magnesium anodes is specified by the Corrosion Supervisor, the following will apply:

- Anodes will normally be installed in the same trench as the pipe (new construction) and a MINIMUM 1' below the pipe.
- Quantity of anodes to be installed will be determined from Table 1 or as designed by the Corrosion Department.

4.9.9.3 IMPRESSED CURRENT ANODE INSTALLATION

Each system will be tested and designed by the Corrosion Department for each individual application.

4.9.10 SERVICE SYSTEMS

4.9.10.1 CORROSION CONTROL REQUIREMENTS

Requirements for corrosion control devices on normal service installations will be determined by the Corrosion Department. The policy is as follows:

- Services installed off of galvanically protected mains may or may not be insulated at the main, at the direction of the Corrosion Supervisor.

- Services installed off of non-protected mains will be insulated at the main and protected as a separate unit.
- When services are installed or repaired with multiple sections of new pipe, separated by either plastic pipe or existing bare pipe, the coated steel sections will be bonded together to form a single system, when possible, or the separate sections will be protected individually.
- Anodes are not required on risers, which have plastic inserts terminating above grade.
- Any large or long services and specific cathodic protection requirements will be recommended by the Corrosion Supervisor or his representative(s).

4.9.10.2 MAGNESIUM ANODE INSTALLATION

Magnesium anodes will be installed on those services insulated at the gas main unless otherwise specified by the Corrosion Supervisor. Anode will be connected directly to the service pipe by means of a Thermit weld unless a test station installation is specified. No mechanical connection methods will be acceptable, unless said mechanical connection is above grade, or sealed with an approved splice kit. The anode is to be located in the same trench as the service pipe, near the service tee (or near the upstream tie-in point when not tying into main). The anode is to be a MINIMUM 1' below the service pipe depth.

4.9.10.3 INSULATOR INSTALLATION

- ALL services will be electrically insulated at the riser or meter. Customer Service will be responsible for installing the insulator on risers or at meter, at the time of meter installation.
- Services installed on cathodically protected coated mains will not be insulated at the main unless specified by the Corrosion Supervisor, or his representative(s).
- Services installed on non-cathodically protected mains will be insulated at the main.
- Services installed on bare, wrought iron or cast iron mains will ALWAYS be insulated at the main.
- Insulate all copper service connections to steel.

4.9.11 BURIED FITTINGS AND VALVES

Each new non-alloy buried steel fitting and/or valve, not able to be included with a cathodic protection system, will be coated and have cathodic protection facilities installed. A 17# anode is required.

4.9.12 LIGHTNING AND POWER FAULT PROTECTION

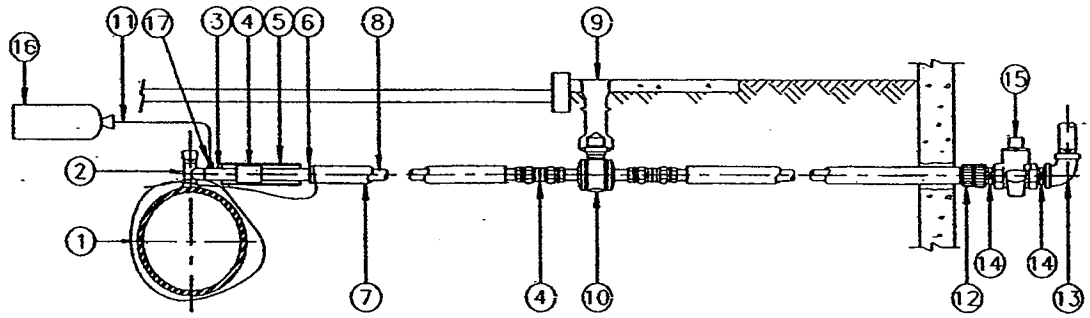
Lightning protection devices will be installed when specified by the Corrosion Supervisor, or his representative(s).

4.9.13 BONDING COMPRESSION AND FLANGE FITTINGS

Bond all compression fittings not intended to act as electrical insulators, when directed by the Corrosion Supervisor or his representative(s).

NSTAR GAS STANDARDS	CORROSION CONTROL	C-522-1/2
	CORROSION CONTROL FOR PLASTIC SERVICES - INSERTS	

FIGURE 1: SERVICE REPLACEMENT BY PLASTIC INSERT



① Existing Main

② Inlet Service Connection (Steel or Cast Iron Main M-143, Plastic M-145)

③ Plastic-to-Steel Transition Fitting (M-145) or Welded Nipple (M-251)

④ Mechanical Coupling (M-122),Socket Fusion (M-145) or Electrofusion Coupling (M-140)

⑤ Protective Sleeve (M-145)

⑥ End Protector Bushing (M-118)

⑦ Abandoned Service

⑧ Plastic Pipe (Service Insert M-252)

⑨ Curb Box (M-27 or M-25)

⑩ Plastic Outside Shut-Off (M-61)

⑪ Wire #10 (Anode Lead)

⑫ Plastic Pipe Adapter Fitting (Service Head Renewal M-146)

⑬ Elbow (M-138)

⑭ Nipple (M-251)

⑮ Inside Shut-Off (M-53)

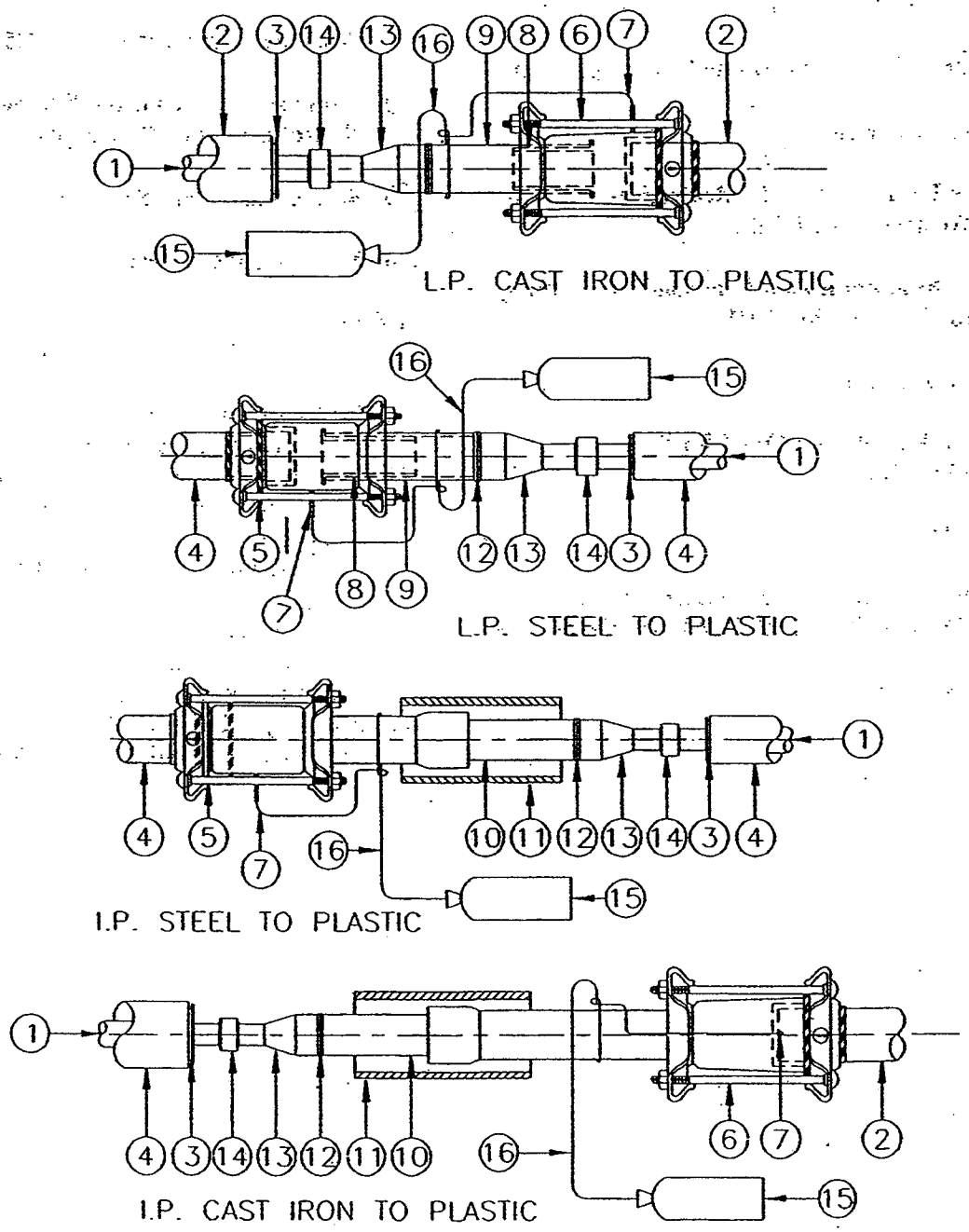
⑯ Magnesium Anode, (M-5)

⑰ Thermit Weld

NOTES

a. See C-222 for installation of plastic services by insert
b. All exposed metal shall be coated in accordance with C-518
c. Install magnesium anode to all service connectors from cast iron mains. If steel mains can be proven to be under rectifier protection, anode installation is not required.
d. If the shutoff is steel (M-51), a 3# anode and a segment of steel pipe should be attached to each end of the valve for torsional stability.

FIGURE 1: MAIN REPLACEMENT BY PLASTIC INSERT



NOTE: SEE PAGE 2 FOR MATERIALS AND NOTES

C-526-2/2	CORROSION CONTROL	NSTAR GAS
	CORROSION CONTROL FOR PLASTIC MAINS - INSERTS	STANDARDS

① Plastic Pipe (Main Insert) (M-252)

② Existing Cast Iron Main

③ Plastic End Protector Bushing (To prevent chafing)

④ Existing Steel Main

⑤ Positive Restraint Bolted / Mechanical Coupling Steel To Steel (M-121/122)

⑥ Positive Restraint Bolted / Mechanical Coupling Cast Iron To Steel (M-121/122)

⑦ Anode Connection

⑧ Stiffener Assembly - **LOW PRESSURE MAINS ONLY**

⑨ Plastic Pipe (M-252)

⑩ Transition Fitting (M-135) - **REQUIRED ON INTERMEDIATE PRESSURE MAIN TIE-INS**

⑪ Protective Sleeve (M-145)

⑫ Butt Fusion(Shown), Socket (M-145) or Electrofusion (M-140) Coupling

⑬ Plastic Reducer Coupling (M-145)

⑭ Butt Fusion, Socket (M-145-Shown) or Electrofusion (M-140) Coupling

⑮ Magnesium Anode, See note

⑯ Wire #10 (Anode Lead)

NOTES

a. See C-112 for installation of Plastic Mains Inserts.
b. Whenever an existing underground steel pipe. is uncovered, it shall be inspected for evidence of corrosion or corrosion conditions and the procedures shown in C-500, paragraph 4, pages 1 & 2, shall be followed.
c. See C-562 for installation of Insulting Compression Couplings. Armored gasket shall be installed on transition fitting.
d. All exposed metal shall be coated in accordance with C-518.
e. Install Type I or Type II Test Station as shown above and in accordance with C-506.

Information Request PESD-12

Please provide any and all documents substantiating NSTAR Gas Company's compliance with its written procedures related to corrosion control for the service pipeline at 65 Main Street, Hopkinton prior to July 24, 2002.

Response

Please refer to the response to Information Request PESD-11 for a copy of the Company's written procedures relating to corrosion control for service pipelines. Please note that none of these procedures impose requirements that would be applicable to 65 Main Street prior to July 24, 2002.

Information Request PESD-13

Please provide all provisions of NSTAR Gas Company's written procedures required by 49 C.F.R. § 192.605 that apply to leakage surveys for distribution systems in Business Districts.

Response

The Company's written procedures relating to "leakage surveys for distribution systems in Business Districts are attached as follows:

(1) Attachment PESD-13(a), entitled "Operations and Maintenance General Procedure OM-60 – Leakage Control;" and

(2) Attachment PESD-13(b), entitled "Operations and Maintenance Procedures for Leak Investigation and Repair".

There is an important distinction in terms of the written procedures that apply to "leakage surveys for distribution systems in Business Districts." This distinction is that the Company has an obligation to perform "periodic leakage surveys" on its distribution system (both within and outside of business districts), which is separate and apart from the obligation to conduct annual "business district surveys." The federal regulation governing "Distribution systems: Leakage surveys" is 49 C.F.R. § 192.723. This regulation establishes a requirement for "periodic leakage surveys" in § 192.605(a) and annual "business district surveys" in § 192.723(b)(1).

Accordingly, the Company's written O&M procedures set forth as Attachment PESD-13(a) and (b) provide for the two separate types of leakage surveys that are conducted on the distribution system in Business Districts: (1) annual business district surveys pursuant to OM-60(5)(c); and (2) periodic leakage surveys pursuant to OM-60(5)(f) and (g).

INSTAR GAS	OPERATING AND MAINTENANCE GENERAL PROCEDURES	OM - 60
Operations & Maintenance	LEAKAGE CONTROL	Page 1 of 10

1. GENERAL

The following is the established procedure for leakage surveys, leak classification, action criteria, and reporting. When evaluating any gas leak, the initial step is to determine the perimeter of the leak area. When the perimeter extends to a building wall, the investigation will continue into the building.

2. DEFINITION OF TERMS

a. **Building:** Any structure, which is normally or occasionally entered by humans for business, residential or other purposes, and in which gas could accumulate.

b. **Building of Public Assembly:** A building where persons would gather for a public event. These buildings would include schools, churches, hospitals, theaters, etc.

c. **Business District:** Areas with wall-to-wall paving and/or where the principal commercial activity of the city or town takes place.

d. **Class Locations:** An area defined and classified by set criteria included in D.O.T. Pipeline Safety Regulations, CFR Title 49 part 192.5.

e. **Combustible Material:** A flammable gaseous material consisting of organic compounds such as methane, benzene, etc.

f. **Confined Space:** A confined space means any space which has a limited means of access and egress, has adequate size and configuration for employee entry, is not designed for continuous employee occupancy and where the atmosphere may be deficient in oxygen content or is subject to the accumulation of toxic or flammable contaminants.

g. **Distribution Main:** A line that serves as a common source of gas supply for more than one service line.

h. **Gas Detector:** An instrument capable of detecting and measuring the percentage concentration of combustible gas in air.

i **Gas Facilities:** All company operated gas lines and related appurtenances.

j. **Leak:** The unintentional escape of gas from containment.

k. **Leak Classifications:**

(1) Class 1 Leak - A leak which represents an existing hazard to persons or property requiring immediate repair or continuous action until conditions are no longer hazardous.
(2) Class 2 Leak - A leak, which is recognized as being non-hazardous at the time of detection, but requires periodic monitoring based on possible future hazard.
(3) Class 3 Leak - A leak that is non-hazardous at the time of detection and can be reasonably expected to remain non-hazardous.

l. **Leak Survey:** A search for possible gas leakage in any area where gas facilities exist, or where a gas leak is reported or suspected.

m. **LEL:** The lower explosive limit, as indicated on a combustible gas indicator, expressed as a percentage of gas in air.

n. **Reading:** A repeated measure of gas indicated on a gas detector. Where the reading is in a confined space, consideration should be given to the rate of dissipation when the space is opened or ventilated for the test and the rate of accumulation when the space is closed.

o. **Service Line:** A distribution line which transports gas from a common source of supply to a customer meter.

p. **Station Piping:** For the purposes of leak surveying, this includes all underground gas pipes and appurtenances within the property lines of regulator stations and other gas operating installations.

q. **Substructure:** Any man-made structure, tunnel, passageway, or other confined space below ground level where gas could accumulate.

3. PRIORITIES

a. Surveillance and repair activities shall be based on such factors as:

(1) The volume, gas-air concentration, and source of the escaping gas.
(2) The size and occupancy of the area where the leakage could occur, and the proximity to structures both above and below ground.
(3) The presence of any substructure or other underground facility that could affect the migration or accumulation of gas.
(4) Soil or surface conditions that could affect the migration of gas.
(5) The proximity to sources of ignition.
(6) Public awareness and reaction to the leak situation.
(7) Soil movement caused by landslides, earthquakes, etc., where external stresses on the pipeline may cause leakage.

3. PRIORITIES

b. After consideration of the above factors, repair priority will be in the order of Class 1, Class 2, and Class 3.

4. LEAK CLASSIFICATION AND ACTION CRITERIA

The following examples of leak conditions and possible action are to be used as guidelines and are not exclusive.

The judgement of company personnel at the scene is of primary importance in determining the classification of a leak and the action to be taken.

a. Class 1 - Classification

(1) Any leak which, in the judgement of company personnel at the scene, is regarded as an immediate hazard.
(2) Any indication of gas, which has migrated into or under a building or structure.
(3) Any reading below ground or which has emanated from below ground at the outside wall of a building.
(4) Escaping gas, which has ignited.
(5) Any reading of 80% LEL, or greater, in a confined space.
(6) Any reading of 80% LEL, or greater, in a non-gas substructure from which gas would likely migrate to the outside wall of a building.
(7) Any reading of 40% LEL, or greater, under a sidewalk which extends to a building wall in wall-to-wall paved area.

b. Class 1 - Action Criteria

Take immediate and continuous action until the hazard no longer exists. Such action may include (but is not limited to or restricted to the order in which they are listed) one or more of the following:

(1) All identified conditions of a hazardous nature to persons or property shall be promptly made safe and permanent repairs instituted.
(2) Evacuate the premises and notify the area Manager or Director of the situation.
(3) Vent the leakage.
(4) Remove sources of ignition.
(5) If burning, prevent the spread of the fire but not necessarily extinguishing burning gas.
(6) Eliminate the source of gas by closing valves or other means.
(7) Restrict public access into the area, including rerouting traffic.

(8) Notify police and fire departments.
(9) If the hazard cannot be rectified, refer to OM-62.

c. **Class 2 - Classification**

(1) Any leak which, in the judgement of company personnel at the scene, is of sufficient magnitude to justify periodic monitoring.
(2) Any leak which, under frozen or other adverse soil conditions, would likely migrate to the outside of a building wall.
(3) Any leak under the street of a wall-to-wall paved area that has a substantial enough spread to indicate the possibility of migrating to the outside wall of a building.
(4) Any reading between 20% LEL and 80% LEL in a confined space.
(5) Any reading between 20% LEL and 80% LEL in a non-gas substructure.
(6) Any reading on a pipeline operating at 20% SMYS, or greater, in a Class 3 or 4 location.

d. **Class 2 - Action Criteria**

Monitor on a periodic basis, the frequency depending on the location and magnitude of the leak. Schedule repair as necessary.

e. **Class 3 - Classification**

All other leaks which are determined to be non-hazardous at the time of detection and can be expected to remain non-hazardous.

f. **Class 3 - Action Criteria**

Reevaluate during next scheduled survey or until leak is reclassified or no longer results in a reading.

5. FREQUENCY OF PERIODIC LEAK SURVEYS

a. **Monthly Survey**

In accordance with the Massachusetts Department of Telecommunications and Energy Order 93-199, dated March 29, 1994, a leak survey of the high pressure pipeline to the Massachusetts Institute of Technology (Third Street to Albany Street, Cambridge) must be conducted monthly.

b. **Quarterly Survey**

Mains in place or on structures where anticipated movement or external loading could cause failure or leakage will be surveyed at intervals not exceeding 4½ months, but at least four times per calendar year [Ref. 192.72 1 (b)].

During these surveys observations will be made of surface conditions on and adjacent to the pipeline right-of-way for indications of leaks, construction activity, and other factors which may affect safety and operation.

c. **Annual Survey**

(1) Business district - A gas detector survey will be conducted at intervals not exceeding one year in business districts including tests of the atmosphere in gas, electric, telephone, sewer, and water system manholes, at cracks in pavement and sidewalks, boxes including gas boxes, and at other locations providing an opportunity for finding gas leaks.

In areas where effectively prescribed and supervised surveys of manholes (electric, telephone, etc.) and vaults is conducted and offers more frequent coverage. Such a survey procedure may be substituted.

The business districts shall be outlined on a map. The map shall be revised as conditions warrant. [Ref. 192.723 (b)(I) ; 220 CMR 101.06 (21)(a)]

(2) Buildings of Public Assembly - A survey will be conducted at least once annually and shall include tests for gas leakage and visual inspection of gas facilities in the immediate area of the service entrance. [Ref. 220 CMR 101.06 (21)(d)]

(3) Mains Operating At A Hoop Stress of 20% SMYS - Leakage surveys of mains operating at a hoop stress at or above 20% SMYS shall be made at intervals not exceeding 15 months, but at least once each calendar year. [Ref. 192.706 (b)]

The following is a list of mains with a hoop stress of 20% SMYS or greater at MAOP:

CAMBRIDGE

(a) J-2 Lateral, McGrath Hwy, Somerville to Third St., Cambridge

MAOP: 329 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 219 p.s.i.g

HOPCO

(a) LNG plant to Wilson Street meter station, Hopkinton

MAOP: 1000 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 445 p.s.i.g

(b) Marathon Station, inlet side

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 611 p.s.i.g

(c) TGP inlet to Marathon Station

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 462 p.s.i.g

(d) TGP/AGT Marathon Station outlet to Wilson Street meter station, Hopkinton

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 462 p.s.i.g

(e) AGT inlet to Marathon Station

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 611 p.s.i.g

(f) Marathon Station, to LNG plant

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 710 p.s.i.g

SOUTHBORO/WORCESTER

(a) Hopkinton-Ashland Transfer Line, Wilson Street, Hopkinton to Pond St. Ashland

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 611 p.s.i.g

d. Every Two Years

(1) Areas not included in business districts. [Ref. 220 CMR 101.06 (21)(b)]
(2) Service stubs shall be identified and a leakage survey made at least once every consecutive twenty-four (24) month period using a gas detector system, such as flame ionization equipment or equivalent devices. [Ref. 220 CMR 107.07 (2)]

e. Every Three Years

Cathodically unprotected metallic distribution lines, which are located outside business districts and are subject to D.O.T. Pipeline Safety Regulations part 192.465(e) on which electrical surveys are impractical.

f. Every Five Years

All other service lines not covered in Section 5, Items a to e, will be surveyed at intervals not exceeding five years. This survey will include 20% of the service lines each year. Persons participating in leakage surveys shall be trained to recognize the possible existence of locations of unknown or unidentified leaking inactive service lines that may be found during the survey. (This will also apply to item 4 above.) [Ref. 220 CMR 107.07 (1)]

g. Additional Leak Surveys

The following is to be used as a guide for conducting additional leak surveys as frequently as experience and technology indicate necessary:

(1) Surveys during winter months when frost heave could result in leakage.
(2) Yearly survey in lieu of two year survey of entire distribution system in addition to the principal business districts. This survey may be performed at a faster rate than the two year survey. It may involve driving in the normal traffic lanes on both sides of the street.
(3) Survey of commercial buildings to include tests for gas leakage and visual inspection of gas facilities in the immediate area of the service entrance.

(4) Manhole surveys outside the business district.
(5) Interim patrols to locate leaks after or during outside construction in the area of gas lines, prior to street resurfacing, and as a result of past leak history or corrosion information.
(6) Pipeline patrols - Refer to OM-78.

6. LEAK SURVEY METHODS

a. The method used for leakage surveys shall include one or more of the following:
   (1) Gas detector survey using combustible gas indicators
   (2) Flame ionization equipment
   (3) Infrared equipment
   (4) Other industry accepted and proved equipment

b. When conducting scheduled surveys the following guidelines will be observed unless otherwise directed:

   (1) Mobile surveys will be performed with a mobile unit at a speed of not more than 5 MPH. The detection instrument will be set on the low scale (0-10 PPM). The survey will be conducted on both sides of the street wherever possible.
   (2) Walking surveys will be performed using a portable flame ionization unit, or other industry accepted equipment, walking in the sidewalk area parallel to the main and along the foundation of the building, and crisscrossing the land between the main and the structure. In the case of a vacant lot, the same pattern will be followed using common sense to establish a bound area. The probe of the instrument will be held as close to the ground as possible while walking. This survey shall encompass all buildings and lots on a given street unless otherwise noted.
   (3) Building surveys will include tests for gas leakage and visual inspection of the gas facilities in the immediate area of the service entrance. Tests will be conducted with a combustible gas indicator or other industry accepted equipment.
   (4) Bridge and other exposed pipe surveys will be performed by walking the designated areas using a portable flame ionization unit or other industry accepted equipment. While conducting the survey the detection probe will be placed as close to the pipe as possible.
   (5) Surveys conducted in a principal business district will involve the testing of the atmosphere in available street openings including electric, telephone, sewer, drain, and water system manholes, catch basins, at cracks in pavement and sidewalks, boxes including gas boxes, and at other locations providing the opportunity for finding gas leaks. These tests will be performed using a combustible gas indicator, flame ionization equipment, or other industry accepted equipment.

(6) Outside surveys will not be performed during wind or weather conditions, which would adversely affect the ability of the survey unit to accurately detect the presence of leaks.
(7) When the person conducting a scheduled survey detects any leak determined to be potentially hazardous and classified as a Class I, they will immediately notify the appropriate personnel and remain at the location of the leak. This person will continue to pinpoint the source of the leak until properly relieved by a supervisor.

7. FOLLOW-UP INSPECTION

The adequacy of leak repairs will be checked before backfilling. The perimeter of the leak area will be checked with a combustible gas indicator. Where there is residual gas in the ground after the repair of a Class 1 leak, a follow-up inspection will be made as soon as practical after allowing the soil atmosphere to vent and stabilize, but in no case later than one month following the repair. In the case of other leak repairs, the need for a follow-up inspection will be determined by qualified personnel.

In order to facilitate a follow-up inspection, the amount of residual gas from a Class I leak must be recorded on the reverse side of Leakage Control Report OD 374.

8. RECORDS

a. Leak survey records for mains operating at or above 20% SMYS must be kept as long as the segment involved remains in service. [Ref. 192.709]

b. All other leak survey records identified in this operating and maintenance plan must be kept on file for a period of time not less than the interval between successive surveys. [Ref. 220 CMR 101.06 (21)(f)]

c. Each leak survey record shall include sufficient information to determine the following at a later date:

(1) The type of survey and date it was conducted.
(2) The personnel conducting the survey and whom they represent.
(3) The area or buildings surveyed.
(4) Location of all leak indications found.

d. In the event of a leak, the person conducting the survey will complete Leakage Control Report OD 374. In addition to the above information the following will be recorded:

(1) The method of survey.
(2) The percent of gas or LEL.
(3) The leak classification.
(4) A sketch providing the location of the underground leak or a detailed description of an above ground leak.
(5) Time reported (Class 1).

e. Leak repair records on all lines will be kept on file for as long as each segment remains in service. Each leak repair record will include:

(1) Information required on the reverse side of Leakage Control Report OD 374 (see attached).
(2) Person responsible for repair.
(3) A sketch of the exact location of the repair and any other pertinent information regarding underground leaks.
(4) Description of repairs made on above ground leaks.
(5) Method used to repair the leak.
(6) Percentage of residual gas after the repair of a Class I leak.

9. OTHER COMBUSTIBLE MATERIAL IN SOIL

If the source of the gas leak can not be found after a thorough investigation by a Leak Surveyor or by a Distribution Crew, one potential cause that must be considered is the presence of other combustible material in the soil.

Once it has been determined the source of the combustible material in the soil is not from our facility, the appropriate public safety office will be notified.

4.10.0 LEAK INVESTIGATION AND REPAIR

4.10.1 GENERAL

The following is the established procedure for leakage surveys, leak classification, action criteria, and reporting. When evaluating any gas leak, the initial step is to determine the perimeter of the leak area. When the perimeter extends to a building wall, the investigation will continue into the building.

4.10.2 DEFINITION OF TERMS

a. **Building:** Any structure, which is normally or occasionally entered by humans for business, residential or other purposes, and in which gas could accumulate.

b. **Building of Public Assembly:** A building where persons would gather for a public event. These buildings would include schools, churches, hospitals, theaters, etc.

c. **Business District:** Areas with wall-to-wall paving and/or where the principal commercial activity of the city or town takes place.

d. **Class Locations:** An area defined and classified by set criteria included in D.O.T. Pipeline Safety Regulations, **CFR** Title **49** part *192.5.*

e. **Combustible Material:** A flammable gaseous material consisting of organic compounds such as methane, benzene, etc.

f. **Confined Space:** A confined space means any space which has a limited means of access and egress, has adequate size and configuration for employee entry, is not designed for continuous employee occupancy and where the atmosphere may be deficient in oxygen content or is subject to the accumulation of toxic or flammable contaminants.

g. **Distribution Main:** A line that serves as a common source of gas supply for more than one service line.

h. **Gas Detector:** An instrument capable of detecting and measuring the percentage concentration of combustible gas in air.

i **Gas Facilities:** All company operated gas lines and related appurtenances.

j. **Leak:** The unintentional escape of gas from containment.

k. **Leak Classifications:**

1. Class 1 Leak - A leak, which represents an existing hazard to persons or property requiring immediate repair or continuous action until conditions are no longer hazardous.
2. Class 2 Leak - A leak, which is recognized as being non-hazardous at the time of detection, but requires periodic monitoring based on possible future hazard.
3. Class 3 Leak - A leak that is non-hazardous at the time of detection and can be reasonably expected to remain non-hazardous.

l. **Leak Survey:** A search for possible gas leakage in any area where gas facilities exist, or where a gas leak is reported or suspected.

m. **LEL:** The lower explosive limit, as indicated on a combustible gas indicator, expressed as a percentage of gas in air.

n. **Reading:** A repeated measure of gas indicated on a gas detector. Where the reading is in a confined space, consideration should be given to the rate of dissipation when the space is opened or ventilated for the test and the rate of accumulation when the space is closed.

o. **Service Line:** A distribution line which transports gas from a common source of supply to a customer meter.

p. **Station Piping:** For the purposes of leak surveying, this includes all underground gas pipes and appurtenances within the property lines of regulator stations and other gas operating installations.

q. **Substructure:** Any man-made structure, tunnel, passageway, or other confined space below ground level where gas could accumulate.

4.10.3 PRIORITIES

a. Surveillance and repair activities shall be based on such factors as:

1. The volume, gas-air concentration, and source of the escaping gas.
2. The size and occupancy of the area where the leakage could occur, and the proximity to structures both above and below ground.
3. The presence of any substructure or other underground facility that could affect the migration or accumulation of gas.
4. Soil or surface conditions that could affect the migration of gas.
5. The proximity to sources of ignition.
6. Public awareness and reaction to the leak situation.
7. Soil movement caused by landslides, earthquakes, etc., where external stresses on the pipeline may cause leakage.

b. After consideration of the above factors, repair priority will be in the order of Class 1, Class 2, and Class 3.

GAS LEAKS

Priorities
When reaching the site of a gas leak, the first concern should be to protect the people in the area and their property from injury or damage, then stop the escaping gas and make the repair according to one of the approved repair procedures.

Distribution System
When gas is escaping from a main or service, eliminate any source of ignition. Keep the vehicles and the equipment upwind and at a safe distance from the work are. Place a fire extinguisher out of the truck and upwind from the work area. Remove any dirt or hard objects to allow the blowing gas to dissipate into the air. Stop the blowing gas with a temporary repair or by closing nearby valves.

Customer Premise
When entering a building with a suspected gas leak, turn on the combustible gas indicator before entering the building and test the air at the ceiling and at the floor near the door. Never do anything that would cause a flame or electric spark while you are searching for a gas leak, such as turning a light on or off or turning a flashlight on or off. Also advise the customer not to turn on or off any light switches or appliances.

EXCAVATION

General
Appropriate procedures shall be followed when working in an excavation where escaping gas is, or will be, present. The supervisor or foreman shall investigate and evaluate alternatives prior to excavation that would reduce or eliminate the need to expose employees to escaping gas. Proper judgment by repair is of utmost importance because of the variety of situations encountered.

Prior to Excavation
Park trucks upwind of proposed excavation. If there is no wind present, check the atmosphere around the trucks for gas buildup before starting any engines and periodically check the area while working. Allow only company authorized personnel near the excavation site.

Remove the fire extinguisher from the truck and place it within 15 feet upwind of the excavation site. Post traffic warning signs and barricades around the work area when appropriate.

Keep all sources of ignition away from the proposed work area. When necessary, reduce pressure as much as is practical on lines where gas is escaping.

Excavation
Use a vent pipe or other equipment to redirect escaping gas away from break. See Section titled "Shoring/Trenching".

WORKING IN AN EXCAVATION WITH ESCAPING GAS

General
Employees working in an excavation where there is escaping gas shall wear gloves and goggles to protect against flying debris and shall wear other personnel protective equipment that is appropriate.

An employee entering an excavation shall wear a respirator when there is an apparent hazard due to escaping gas is determined by the supervisor.

For each employee wearing a respirator working in an excavation, another employee shall be assisting at grade level, also wearing a respirator. When there is any doubt whether a hazardous condition exists, a respirator shall be worn.

Hazardous Conditions
The following variables should be considered when determining if a condition is hazardous:

- Amount of escaping gas
- System's operating pressure
- Depth and size of excavation
- Wind speed and direction
- Amount of humidity in the air
- Degree of confinement in leak area

4.10.4 LEAK CLASSIFICATION AND ACTION CRITERIA

The following examples of leak conditions and possible action are to be used as guidelines and are not exclusive.

The judgment of company personnel at the scene is of primary importance in determining the classification of a leak and the action to be taken.

a. **Class 1 - Classification**

1. Any leak which, in the judgment of company personnel at the scene, is regarded as an immediate hazard.
2. Any indication of gas, which has migrated into or under a building or structure.
3. Any reading below ground or which has emanated from below ground at the outside wall of a building.
4. Escaping gas, which has ignited.

5. Any reading of 80% LEL, or greater, in a confined space.
6. Any reading of 80% LEL, or greater, in a non-gas substructure from which gas would likely migrate to the outside wall of a building.
7. Any reading of 40% LEL, or greater, under a sidewalk which extends to a building wall in wall-to-wall paved area.

b. **Class 1 - Action Criteria**

Take immediate and continuous action until the hazard no longer exists. Such action may include (but is not limited to or restricted to the order in which they are listed) one or more of the following:

1. All identified conditions of a hazardous nature to persons or property shall be promptly made safe and permanent repairs instituted.
2. Evacuate the premises and notify the area Superintendent or Director of the situation.
3. Vent the leakage.
4. Remove sources of ignition.
5. If burning, prevent the spread of the fire but not necessarily extinguishing burning gas.
6. Eliminate the source of gas by closing valves or other means.
7. Restrict public access into the area, including rerouting traffic.
8. Notify police and fire departments.
9. If the hazard cannot be rectified, refer to OM-62.

On all Class I leaks, the sources of escaping gas must be identified and addressed with either temporary or permanent repairs.

c. **Class 2 - Classification**

1. Any leak which, in the judgment of company personnel at the scene, is of sufficient magnitude to justify periodic monitoring.
2. Any leak which, under frozen or other adverse soil conditions, would likely migrate to the outside of a building wall.
3. Any leak under the street of a wall-to-wall paved area that has a substantial enough spread to indicate the possibility of migrating to the outside wall of a building.
4. Any reading between 20% LEL and 80% LEL in a confined space.
5. Any reading between 20% LEL and 80% LEL in a non-gas substructure.
6. Any reading on a pipeline operating at 20% SMYS, or greater, in a Class 3 or 4 location.

d. **Class 2 - Action Criteria**

Monitor on a periodic basis, the frequency depending on the location and magnitude of the leak. Schedule repair as necessary.

e. **Class 3 - Classification**

All other leaks which are determined to be non-hazardous at the time of detection and can be expected to remain non-hazardous.

f. **Class 3 - Action Criteria**

Reevaluate during next scheduled survey or until leak is reclassified or no longer results in a reading.

4.10.5 FREQUENCY OF PERIODIC LEAK SURVEYS

a. **Monthly Survey**

In accordance with the Massachusetts Department of Telecommunication and Energy Order 93-199, dated March 29, 1994, a leak survey of the high-pressure pipeline to the Massachusetts Institute of Technology (Third Street to Albany Street, Cambridge) must be conducted monthly.

b. **Quarterly Survey**

Mains in place or on structures where anticipated movement or external loading could cause failure or leakage will be surveyed at intervals not exceeding 4 ½ months, but at least four times per calendar year [Ref. 192.721 (b)].

During these surveys observations will be made of surface conditions on and adjacent to the pipeline right-of-way for indications of leaks, construction activity, and other factors which may affect safety and operation.

c. **Annual Survey**

1. Business district - A gas detector survey will be conducted at intervals not exceeding one year in business districts including tests of the atmosphere in gas, electric, telephone, sewer, and water system manholes, at cracks in pavement and sidewalks, boxes including gas boxes, and at other locations providing an opportunity for finding gas leaks.

   In areas where effectively prescribed and supervised surveys of manholes (electric, telephone, etc.) and vaults is conducted and offers more frequent coverage. Such a survey procedure may be substituted.

   The business districts shall be outlined on a map. The map shall be revised as conditions warrant. [Ref. 192.723 (b)(I); 220 CMR 101.06 (21)(a)]

2. Buildings of Public Assembly - A survey will be conducted at least once annually and shall include tests for gas leakage and visual inspection of gas facilities in the immediate area of the service entrance. [Ref. 220 CMR 101.06 (21)(d)]

3. Mains Operating At A Hoop Stress of 20% SMYS - Leakage surveys of mains operating at a hoop stress at or above 20% SMYS shall be made at intervals not exceeding 15 months, but at least once each calendar year. [Ref. 192.706 (b)]

   The following is a list of mains with a hoop stress of 20% SMYS or greater at MAOP:

   CAMBRIDGE

   a. J-2 Lateral, McGrath Hwy, Somerville to Third St., Cambridge

      MAOP: 329 p.s.i.g

      Operating pressure equivalent to a hoop stress of 20% SMYS: 219 p.s.i.g

   HOPCO

   a. LNG plant to Wilson Street meter station, Hopkinton

      MAOP: 1000 p.s.i.g

      Operating pressure equivalent to a hoop stress of 20% SMYS: 445 p.s.i.g.

   b. Marathon Station, inlet side

      MAOP: 800 p.s.i.g

      Operating pressure equivalent to a hoop stress of 20% SMYS: 611 p.s.i.g

   c. TGP inlet to Marathon Station

      MAOP: 800 ps.ig.

      Operating pressure equivalent to a hoop stress of 20% SMYS: 462 p.s.i.g.

   d. TGP/AGT Marathon Station outlet to Wilson Street meter station, Hopkinton

      MAOP: 800 p.s.i.g.

      Operating pressure equivalent to a hoop stress of 20% SMYS: 462 p.s.i.g.

e. AGT inlet to Marathon Station

MAOP: 800 p.s.i.g.

Operating pressure equivalent to a hoop stress of 20% SMYS: 611 p.s.i.g.

f. Marathon Station, to LNG plant

MAOP: 800 p.s.i.g.

Operating pressure equivalent to a hoop stress of 20% SMYS: 710 p.s.i.g.

SOUTHBORO/WORCESTER

a. Hopkinton-Ashland Transfer Line, Wilson Street, Hopkinton to Pond St. Ashland

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 611 p.s.i.g

d. **Every Two Years**

1. Areas not included in business districts. [Ref. 220 CMR 101.06 (21)(b)]
2. Service stubs shall be identified and a leakage survey made at least once every consecutive twenty-four (24) month period using a gas detector system, such as flame ionization equipment or equivalent devices. [Ref. 220 CMR 107.07 (2)]

e. **Every Three Years**

Cathodically unprotected metallic distribution lines, which are located outside business districts and are subject to D.O.T. Pipeline Safety Regulations part 192.465(e) on which electrical surveys are impractical.

f. **Every Five Years**

All other service lines not covered in Section 3.11.5, Items a to e, will be surveyed at intervals not exceeding five years. This survey will include 20% of the service lines each year. Persons participating in leakage surveys shall be trained to recognize the possible existence of locations of unknown or unidentified leaking inactive service lines that may be found during the survey. [Ref. 220 CMR 107.07 (1)]

g. **Additional Leak Surveys**

The following is to be used as a guide for conducting additional leak surveys as frequently as experience and technology indicate necessary:

1. Surveys during winter months when frost heave could result in leakage.
2. Yearly survey in lieu of two-year survey of entire distribution system in addition to the principal business districts. This survey may be performed at a faster rate than the two-year survey. It may involve driving in the normal traffic lanes on both sides of the street.
3. Survey of commercial buildings to include tests for gas leakage and visual inspection of gas facilities in the immediate area of the service entrance.
4. Manhole surveys outside the business district.
5. Interim patrols to locate leaks after or during outside construction in the area of gas lines, prior to street resurfacing, and as a result of past leak history or corrosion information.
6. Pipeline patrols - Refer to OM-78.

4.10.6 LEAK SURVEY METHODS

a. The method used for leakage surveys shall include one or more of the following:
   1. Gas detector survey using combustible gas indicators
   2. Flame ionization equipment
   3. Infrared equipment
   4. Other industry accepted and proved equipment

b. When conducting scheduled surveys the following guidelines will be observed unless otherwise directed:

   1. Mobile surveys will be performed with a mobile unit at a speed of not more than 5 MPH. The detection instrument will be set on the low scale (0-10 PPM). The survey will be conducted on both sides of the street wherever possible.
   2. Walking surveys will be performed using a portable flame ionization unit, or other industry accepted equipment, walking in the sidewalk area parallel to the main and along the foundation of the building, and criss-crossing the land between the main and the structure. In the case of a vacant lot, the same pattern will be followed using common sense to establish a bound area. The probe of the instrument will be held as close to the ground as possible while walking. This survey shall encompass all buildings and lots on a given street unless otherwise noted.
   3. Building surveys will include tests for gas leakage and visual inspection of the gas facilities in the immediate area of the service entrance. Tests will be conducted with a combustible gas indicator or other industry accepted equipment.
   4. Bridge and other exposed pipe surveys will be performed by walking the designated areas using a portable flame ionization unit or other industry accepted equipment. While conducting the survey the detection probe will be placed as close to the pipe as possible.

5. Surveys conducted in a principal business district will involve the testing of the atmosphere in available street openings including electric, telephone, sewer, drain, and water system manholes, catch basins, at cracks in pavement and sidewalks, boxes including gas boxes, and at other locations providing the opportunity for finding gas leaks. These tests will be performed using a combustible gas indicator, flame ionization equipment, or other industry accepted equipment.
6. Outside surveys will not be performed under wind and weather conditions, which would adversely affect the ability of the survey unit to accurately detect the presence of leaks.
7. When the person conducting a scheduled survey detects any leak determined to be potentially hazardous and classified as a Class I, they will immediately notify the appropriate personnel and remain at the location of the leak. This person will continue to pinpoint the source of the leak until properly relieved by a supervisor.

4.10.7 FOLLOW-UP INSPECTION

The adequacy of leak repairs will be checked before backfilling. The perimeter of the leak area will be checked with a combustible gas indicator. Where there is residual gas in the ground after the repair of a Class 1 leak, a follow-up inspection will be made as soon as practical after allowing the soil atmosphere to vent and stabilize, but in no case later than one month following the repair. In the case of other leak repairs, the need for a follow-up inspection will be determined by qualified personnel.

In order to facilitate a follow-up inspection, the amount of residual gas from a Class I leak must be recorded on the reverse side of Leakage Control Report OD 374.

4.10.8 RECORDS

a. Leak survey records for mains operating at or above 20% SMYS must be kept as long as the segment involved remains in service. [Ref. 192.709]

b. All other leak survey records identified in this operating and maintenance plan must be kept on file for a period of time not less than the interval between successive surveys. [Ref. 220 CMR 101.06 (21)(f)]

c. Each leak survey record shall include sufficient information to determine the following at a later date:
   1. The type of survey and date it was conducted.
   2. The personnel conducting the survey and whom they represent.
   3. The area or buildings surveyed.
   4. Location of all leak indications found.

d. In the event of a leak, the person conducting the survey will complete Leakage Control Report OD 374 (see attached). In addition to the above information the following will be recorded:

1. The method of survey.
2. The percent of gas or LEL.
3. The leak classification.
4. A sketch providing the location of the underground leak or a detailed description of an above ground leak.
5. Time reported (Class 1).

e. Leak repair records on all lines will be kept on file for as long as each segment remains in service. Each leak repair record will include:

1. Information required on the reverse side of Leakage Control Report OD 374.
2. Person responsible for repair.
3. A sketch of the exact location of the repair and any other pertinent information regarding underground leaks.
4. Description of repairs made on above ground leaks.
5. Method used to repair the leak.
6. Percentage of residual gas after the repair of a Class I leak.

4.10.9 OTHER COMBUSTIBLE MATERIAL IN SOIL

If the source of the gas leak can not be found after a thorough investigation by a Leak Surveyor or by a Distribution Crew, one potential cause that must be considered is the presence of other combustible material in the soil.

Once it has been determined the source of the combustible material in the soil is not from our facility, the appropriate public safety office will be notified.

4.10.10 REPAIR OF PLASTIC MAINS

General
The only approved method of permanent repairs to the PE pipe involves removal and replacement of the damaged section of pipe. It may however be necessary to make temporary repairs until time and conditions permit replacement.

Use of a band clamp to facilitate the temporary repair of pinholes, splits or minor circumferential breaks is permissible and shall be used as follows:

a. Clean the main in the immediate area of the damage.

b. Spread the repair clamp enough to fit around the pipe.

c. Place the clamp over the damaged area so that it fully encircles the pipe.

d. Connect the bolt(s) and tighten evenly until the clamp is firmly installed on the pipe.

e. Soap test the entire clamp on both ends to assure gas tight installation.

f. Make note of the exact location of the repair and take ties of the repair if the excavation must be temporary back-filled.

g. Make arrangements to return for permanent replacement of the damaged section of PE pipe.

Permanent Repairs to PE Pipe
Replacement of PE pipe will involve different procedures depending on whether the pipe is a main or a service.

On damaged service pipe, arrangements are made with the customer and the service is shut down. The damaged section of the pipe is removed and replaced with new, pre-tested pipe of the same type and the line is gassed. After testing at the connections, the service is re-activated and the appliance re-lighting procedure is followed.

On damaged mains with a one way feed, arrangements are made to install a by-pass of adequate size to carry the load. When the by-pass is installed and activated, the squeeze off procedure (see O&M section 3.7.3) is performed in two separate locations away from the repair area. A pre-tested section of pipe is installed using approved joining methods (mechanical or fusion), and after the proper cooling time has elapsed, the line is re-activated. Each repair joint is soap tested and the by-pass is then removed according to company procedures.

NOTE: Prior to shut off or re-activation of main lines, the Gas Supply Department must be notified. Conditions such as location and ambient temperature can effect the operation and can dictate the timing of the repair.

4.10.11 REPAIR OF STEEL MAINS

General
When leakage or damage of steel mains has been discovered, the extent and kind of damage determines the repair method. The methods discussed in this section involve repairing an existing steel pipeline. In addition to these methods, repairs may also be made, in some situations, by plastic insertion. If the main has extensive damage, plastic pipe may be inserted, provided that the plastic pipe is large enough to meet the load demands for that section of main.

On low-pressure mains, it may be possible to use the soap tape and bandage method to temporarily stop or slow the leak. However, the pipe and repair section should not be buried unless arrangements are made to properly vent the leak. Permanent repairs should be made as soon as possible.

Repair Methods
When it is determined that the main is sound, repairs may be made as follows:

A. Welding
Steel mains of any diameter or pressure, may be repaired by welding. All welding must be performed according to the procedures set forth by welding standards.

B. Clamping
A clamp prevents leakage by compressing a gasket directly onto the damaged area. The gasket material is compatible for use with natural gas, and the clamp is designed by the manufacturer to distribute compression of the gasket as evenly as possible. Clamps are classified for permanent or temporary repair.

1. Permanent repair - the clamp repair must restore the leaking or damaged section of the main to a condition equal to or better than the main adjoining the clamp. NOTE: When a clamp is used to perform a permanent repair, company standards relating to the coating and cathodic protection procedures must be followed.

2. Temporary repair - the clamp repair is installed for a short time to stop leakage until the main can be replaced or permanently repaired. When welding is not an option, clamping is the preferred method.

   Do not use clamps where the pipe has been weakened by extensive corrosion, or distorted and weakened by damage from external forces. Clamps generally are not designed to reinforce the pipe from the causes of such external stress. A reinforcement sleeve must be used under these conditions.

C. Sleeving
A repair sleeve is a device to prevent gas from escaping by containing the leakage within the body of the sleeve. Repair sleeves may be either bolt on or weld-on styles. The gaskets in bolt-on sleeves differ from those in clamps, since they do not seal directly against the leaking or damaged area of the pipe. Instead, they are designed retain pressure within the sleeve body. Sleeves are designed to reinforce the pipe when it is either circumferentially or externally broken.

NOTE: Repair sleeves used for permanent repair on a steel main must be coated and bonded to the main with cathodic protection if the main is not already protected through the use of a rectifier.

Leak Testing
After repairs are made on steel main, a leak test must be performed using a soap solution. Gas detection equipment may also be used in addition to the soap test. Where steel pipe has been replaced by pre-tested polyethylene (PE) pipe, each connection must also be soap tested.

4.10.12 REPAIR OF CAST IRON MAINS

General
Cast Iron pipe is brittle and subject to breaks, graphitization, and leaks. It is no longer used in new construction and is being slowly removed from service in compliance with Massachusetts state law. Where cast iron is still in service, it must be protected against any unusual loading, pressure, or other potentially damaging conditions.

Corrosion
Graphitization is a form of corrosion in which iron is converted to corrosion, leaving graphite. The pipe appears intact, but it is soft and can be shaved or chipped away with a knife or hammer. Graphitization may be general or localized as follows:

A. General graphitization - If there is general graphitization to a degree where fractures or leaks might occur or are occurring, the pipe must be replaced or repaired to prevent any leakage.

B. Localized graphitization - If there is localized graphitization to a degree where leaks are occurring, the pipe must be replaced or repaired to prevent any leakage.

Protecting Cast Iron Mains
Whenever excavation might disturb or affect the earth supporting a cast iron main, certain measures must be taken to protect it. (See O&M section 3.3.4)

Repair Methods
Repairs needed on cast iron consist mainly of:

A. Stopping bell joint leaks
B. Repairing fractures or breaks

Permanent repair of fractures or breaks is normally done by installing mechanical split sleeves. Repair with full encirclement clamps can be considered permanent if no additional reinforcement to the main is required. Mechanical joint repairs are made through the use of bell joint clamps and/or encapsulation.

Information Request PESD-14

Please provide any and all documents substantiating NSTAR Gas Company's compliance with its written procedures related to leakage surveys for the service pipeline and other operator equipment at 65 Main Street, Hopkinton.

Response

Please see the response to Information Request PESD-13, documenting the relevant procedures.

Please see the response to Information Request PESD-2, which includes the documents maintained in relation to those procedures.

In accordance with 220 C.M.R. § 101.06(21)(f), survey records are maintained only until the next survey of that type is completed, and therefore, documentation of business district and periodic leak surveys in the years preceding 2002 is not available.

Information Request PESD-15

Please provide all provisions of NSTAR Gas Company's written procedures required by 49 C.F.R. § 192.605 that apply to the establishment of a MAOP for pipelines operating at pressures less than 100 psig.

Response

Please see the following procedures, which are contained in the Company's currently effective O&M Operating Manual regard regarding the establishment of a MAOP for lines operating at less than 100 psig:

(1) Attachment PESD-15(a), the Operating and Maintenance General Procedures, OM-74, Operating Pressures;

(2) Attachment PESD-15(b), the Company Construction Standard C-186 (Testing Gas Mains);

(3) Attachment PESD-15(c), the Company Construction Standard C-245 (Testing Gas Services);

(4) Attachment PESD-15(d), the Company Construction Standard C-222 (Current Gas Standards).

Missing 15(d)

NSTAR GAS Operations & Maintenance	OPERATING AND MAINTENANCE GENERAL PROCEDURES	OM - 74
	OPERATING PRESSURES	Page 1 of 2

This procedure applies to the determination of safe operating pressures.

1. **Maximum Allowable Operating Pressures (MAOP)**

   a. Where definite records regarding the installation and testing of a particular pipeline are not available, it shall be assumed that the highest actual operating pressure to which the pipeline was subjected between July 1, 1965 and July 1, 1970, is the MAOP for that pipeline.

   b. Where a. above shall apply and a higher operating pressure is desired, that pressure may be established through compliance with OM-82.

   c. Where definite records regarding the installation and testing of a particular pipeline are available, the MAOP shall be determined by dividing the recorded test pressure by a factor of 1.5 for steel or plastic pipe.

   d. Cast iron pipe in which there are unreinforced bell and spigot joints may not, under any circumstances, be operated above 25 psig.

   e. In no case may the operating pressure exceed the weakest element in the pipeline or any equipment, which will be subjected to that operating pressure.

   f. If personal judgment, based on a pipeline's corrosion and operating history, should indicate that the safe operating pressure is less than the allowable operating pressure, then that judgment shall be established as the MAOP until the situation can be corrected. Over pressure protection must be supplied if the MAOP can be exceeded.

2. **Maximum and Minimum Operating Pressure - Low-Pressure Distribution System**

   a. For the purpose of these standards, a low pressure distribution system is one which the pressure in the main is equal to or less than 2 psig.

   b. The maximum and minimum allowable operating pressures shall be limited to those which will ensure the safe and continued operation of any properly connected and adjusted low pressure gas burning equipment.

   c. For good operation the pressure range downstream of the meter should be between 4" w.c. and 14" w.c. unless the customer's equipment is designed to operate outside the range.

3. **Maximum Allowable Operating Pressure - Intermediate and High-Pressure Distribution Systems**

a. Intermediate pressure distribution systems may be operated at pressures not to exceed 60 psig, provided the system is equipped with overpressure protection and each service is equipped with a service regulator as described in NSTAR Gas Material Specification M-300 or M301 and installed in accordance with NSTAR Gas Construction Standards C-314, C-316 or C-320.

b. High pressure distribution systems may be operated above 60 psig but less than 100 psig provided the system is equipped with overpressure protection equipment as described in NSTAR Gas Material Specification M-300, or M-301, M-303 and installed in accordance with NSTAR Gas Construction Standards C-314, C-316 or C-320 and C-216.

c. High pressure distribution systems may be operated at or above 100 psig but less than 200 psig provided the system is equipped with overpressure protection equipment as described in NSTAR Gas Material Specification M-300 or M-301, M-303, M-305 and installed in accordance with NSTAR Gas Construction Standards C-314, C-316 or C-320, and C-218.

d. Any high pressure distribution system designed to be operated above 200 psig will be designed for the specific MAOP by the Engineering department.

NSTAR GAS STANDARDS	MAINS	C-186-1/4
	TESTING OF GAS MAINS	

1. SAFETY

Personnel and public safety will be the priority concern when performing a pressure test. Properly installed positive restraint end caps or fused or welded end caps will be used during the test. Situations that require the use of non-positive restraint end caps will be approved by the Area Manager or Director prior to installation. In the event a non-positive restraint end cap is approved, it must be properly secured according to the proper procedure for installing and welding a restraint assembly. At all times, when any mechanical end cap is used, personnel will be directed to evacuate the trench and stand clear of the downstream side of the end cap while the line is pressurized. Precautions will be taken to secure the area downstream of the end cap to protect the public.

In the event any mechanical end cap, positive or non-positive restraint, leaks during the pressure test the line will be blown down completely prior to personnel entering the excavation to make adjustments on the end cap.

2. GENERAL

The test medium will normally be air, inert gas or water.

Mains will be pressure tested according to Items 3 through 8 of this section. Once the main is pressurized to the test pressure, the test medium source must be disconnected.

Mains may be tested in sections. For steel mains, standard weld caps of the same pipe schedule as that being tested or flat plate test heads with the thickness and fabrication method shown in C-146 should be welded to the ends of the section to be tested. All welds must be the same strength and quality as other pipe joints. Upon completing the test, the weld caps or flat plate test head, including the weld, shall be cut off from the test section. See C-110 for plastic main ends. Mechanical couplings, either positive or non-positive restraint, will not be used for testing unless previously approved by the area superintendent or Director. In the event a mechanical coupling is approved, positive restraint end caps will be installed according to O&M Procedure 3.5.9. If a non positive restraint end cap is to be used, it must be installed according to O&M Procedure 3.7.4.

If the main is not to be immediately placed in service, air or inert gas may be left in the main at a reduced pressure as directed by the Director of Distribution. Otherwise upon completion of testing, the main or section shall be blown down. Approval of the test by the Director of Distribution shall be followed without undue delay by purging (see C-182).

Tie-in connections shall be soap tested at the available line pressure.

3. STEEL MAINS (100 PSIG OR LESS)

Steel mains to be operated below 100 psig shall be tested for tightness to at least 90 psig for at least one hour. Loss of pressure due to leakage during the test is not allowable. If the main is over 1,000 feet in length it shall be tested to at least 90 psig for at least 24 hours. A recording pressure gauge shall be used. Loss of pressure due to leakage during the test is not allowable.

4. STEEL MAINS (100 PSIG TO 150 PSIG)

Steel mains to be operated at a pressure greater than 100 psig and less than 150 psig shall be tightness tested to 1.5 times the MAOP for at least one hour. Loss of pressure due to leakage during the test is not allowable. If the main is over 1,000 feet in length it shall be tested to 1.5 times the MAOP for at least 24 hours. A recording pressure gauge shall be used. Loss of pressure due to leakage during the test is not allowable.

See paragraph 7 for required records.

5. STEEL MAINS (GREATER THAN 150 PSIG AND LESS THAN 30% SMYS)

Steel mains to be operated at a pressure greater than 150 PSIG and less than 30% SMYS shall be inert gas, air or hydrostatically tested for tightness to 1.5 times the MAOP.

If the main is to be stressed in excess of 20% SMYS during the test and inert gas or air is the test medium, a leak test must be made between 100 PSIG and 20% SMYS or the line walked to check for leaks while hoop stress is held at approximately 20% SMYS.

Steel mains less than 1,000 feet in length shall be tested to the above pressure requirements for at least four hours. Loss of pressure due to leakage during the test is not allowable.

Steel mains 1,000 feet or more in length shall be tested to the above pressure requirements for at least 24 hours. Loss of pressure due to leakage during the test is not allowable.

Calibrated recording instruments verified by dead weight instruments are to be used and the recording submitted to the Massachusetts Department of Telecommunications and Energy for certification that the steel main, as defined, may be operated at a pressure which is equal to the test pressure divided by a factor of 1.5. The pressure test may be witnessed by the Mass D.T.E.

See paragraph 7 for required records.

6. STEEL MAINS (30% SMYS OR GREATER)

Steel mains to be operated at 30% SMYS or greater, shall be strength tested in accordance with 49CFR 192.505 and 192.515.

See paragraph 7 for required records.

7. PLASTIC MAINS (100 PSIG OR LESS)

Plastic mains to operate at or below 100 PSIG shall be tested to 1.5 times the MAOP or 90 PSIG, whichever is greater. In any case, the test pressure shall be limited to 3 times the design pressure of the pipe. The temperature of thermoplastic material must not exceed 100°F during the test. Refer to C-900, 17/17 for design pressure.

Plastic mains less than 1,000 feet in length shall be tested to the above pressure requirements for at least one hour. Loss of pressure due to leakage during the test is not permitted.

Plastic mains 1,000 feet or more in length shall be tested to the above pressure requirements for at least 24 hours. For this test, a recording pressure gauge shall be used. Loss of pressure due to leakage during the test is not permitted.

8. RECORDS

A record of each test performed on pipelines to operate in excess of 100 PSIG shall be made and retained for the life of the pipeline. The record must contain at least the following:

a. The operator's name, the name of the operator's employee responsible for making the test, and the name of any test company used.

b. The test medium used.

c. The test pressure.

d. The test duration.

e. The pressure recording charts, or other record of pressure readings.

f. Elevation variations, whenever significant for the particular test.

g. Leaks and failures noted and their disposition.

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Attachment
PESD-15 (c)

NSTAR GAS STANDARDS	SERVICES	C-245-1/2
	TESTING GAS SERVICES	

1. GENERAL

   a. The test medium shall be compressed air or inert gas.
   b. The test medium shall be preferably supplied at the street end of the service through the top of the tapping tee before the tap is completed. When stub services have been previously installed, the test medium may be applied at the meter riser. The test medium source must be disconnected during the test. Any drop in pressure during the test period shall constitute leakage and must be located and repaired before repeating the test. Upon satisfactory completion of the test, the test medium shall preferably be relieved at the street end. Refer to C-247 for purging.
   c. Tie-in joints shall be tested for tightness at the available pressure after the gas is turned on to the service.
   d. A record of each test performed shall be made and retained. The Activity Report or other record must contain at least the following.
      1) The operator's name, the name of the operator's employee responsible for making the test, and the name of any test company used.
      2) The test medium used - For services over 100 psig MAOP or if other than compressed air
      3) The test pressure
      4) The test duration
      5) Pressure recording charts, or other record of pressure readings
      6) Elevation variations, whenever significant for the particular test
      7) Leaks and failures noted and their disposition

2. STEEL SERVICES (100 PSIG OR LESS)

   a. Steel services with a maximum allowable operating pressure (MAOP) of 100 PSIG or less shall be tested for tightness to at least 90 PSIG for a period of at least 15 minutes.
   b. A pressure testing gage or recording device with a range and accuracy rating of ASME B40.1 Grade B minimum (Commercial/Utility) should be used for tightness testing to detect leakage. The test pressure should fall between 25% and 75% of the maximum gage range.

3. STEEL SERVICES (OVER 100 PSIG TO 30% SMYS)

   a. Steel services with a maximum allowable operating pressure (MAOP) greater than 100 PSIG, but to a pressure which produces hoop stress less than 30% of the Specified Minimum Yield Strength (SMYS), shall be tested for tightness to at least 1.5 times the MAOP for a period of at least one hour.
   If during the test, the segment is to be stressed to 20% of SMYS, a leak test must be made between 100 PSIG and 20% SMYS or the service must be walked to check for leaks while the hoop stress is held at approximately 20% SMYS. The pressure must be maintained at or above the test pressure for at least one hour.

4. PLASTIC SERVICES

   a. Plastic with a MAOP of 100 PSIG or less, shall be tested to 1.5 times the MAOP or to 90 PSIG, whichever is greater, for a period of at least 15 minutes. In any case, the test pressure shall be limited to three times the design pressure. The temperature of thermoplastic material must not exceed 100 degrees fahrenheit during the test.
   b. Provisions a, b, c and d in section 1 (above) also apply to plastic services.

5. SERVICES DISCONNECTED FROM THE MAIN

   a. Each service line that is temporarily disconnected, tied over to a relaid main, or reinstated after abandonment, must be tested in the same manner as a new service line, except that each temporarily disconnected steel service line that is to be operated at a pressure not in excess of 1 psig may be tested to at least 10 psig for at least 15 minutes.
   b. A record of the pressure test of each such service must be made and retained.
   c. If continuous service is maintained, the part of the service line used to maintain service need not be tested.

NSTAR GAS	SERVICES	C-222-1/6
STANDARDS	SERVICE REPLACEMENT BY PLASTIC INSERT 60 PSIG OR LESS	

FIGURE 1: PLASTIC INSERT AND THE INLET SERVICE CONNECTION

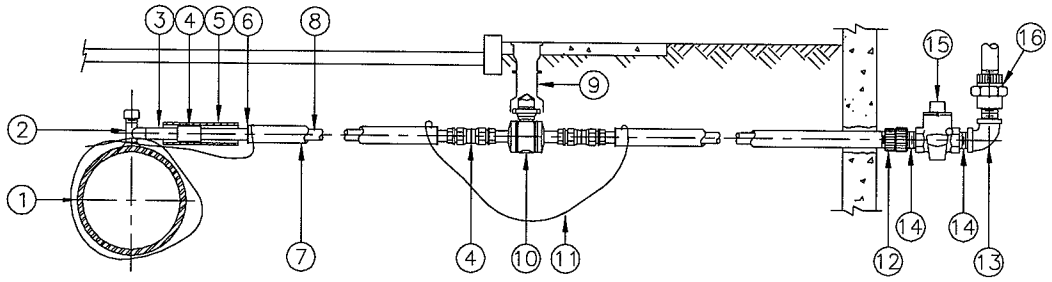


FIGURE 1a: INTERMEDIATE PRESSURE

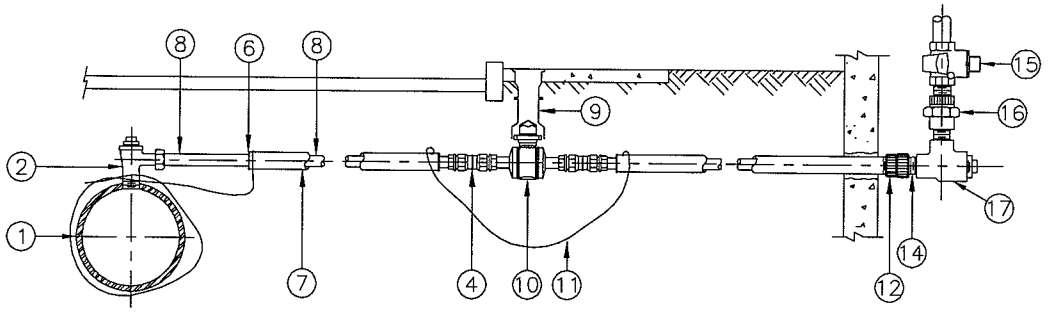


FIGURE 1b: LOW PRESSURE

① Existing Main

② Inlet Service Connection (Steel or Cast Iron Main M-143, Plastic M-145)(M-131, LP only)

③ Plastic-to-Steel Transition Fitting (M-135) or Welded Nipple (M-251)

④ Mechanical Coupling (M-122),Socket Fusion (M-145) or Electrofusion Coupling (M-140)

⑤ Protective Sleeve (M-135)

⑥ End Protector Bushing (M-118)

⑦ Abandoned Service

⑧ Plastic Pipe (Service Insert M-252)

⑨ Curb Box (M-27 or M-25)

⑩ Plastic Outside Shut-Off (M-61)

⑪ Tracer Wire

⑫ Plastic Pipe Adapter Fitting (Service Head Renewal M-146)

⑬ Elbow (M-138)

⑭ Nipple (M-251)

⑮ Inside Shut-Off (M-53). See Note a.

⑯ Insulated Union (M-163)

⑰ Approved Fitting (M-133)

⑱ Excess Flow Valve (M-306

NOTE: SEE PAGE 2 FOR NOTES

C-222-2/6	SERVICES	NSTAR GAS
	SERVICE REPLACEMENT BY PLASTIC INSERT 60 PSIG OR LESS	STANDARDS

INSTALLATION INSTRUCTIONS

a. Shut off and make the required cuts to isolate the service section to be inserted. Insulate interior piping as close to the wall as possible.
b. Clean, ream, and blow out the isolated section when necessary.
c. Insert the Carrier Pipe, using a Bull-Nose Protector on the forward end.
d. Make up fittings between the Plastic Insert and the Inlet Service Connection, the Outside Shut-Off, and at the Through-Wall Service as required.
e. Provide protection around the Carrier Pipe at the ends of the Casing Pipe.
f. See C-245 for Pressure Test.
g. See C-522 for Corrosion Protection.
h. Use Pipe Dope Sealant at all threaded metal joints.
i. See C-173 for the Handling and Installation of Plastic Pipe.
j. See C-720 for Safety Procedures.
k. Bond isolated sections of abandoned service using tracer wire before inserting plastic pipe. Coil tracer wire around main without making metallic contact. For steel or cast iron main connect 17 pound magnesium anode to tap connection using thermit weld or mechanical clamp as appropriate.

NOTES

Due to the fact that plastic pipe service replacements have been squeezed off by ice confined between it and the abandoned service it has been inserted in, the following should be considered in areas of known high water table:

½" CTS Plastic should not be inserted in an abandoned service larger than 1" IPS.

¾" CTS Plastic should not be inserted in an abandoned service larger than 1¼" IPS.

1" CTS Plastic should not be inserted in an abandoned service larger than 2" IPS.

1¼" CTS Plastic should not be inserted in an abandoned service larger than 3" IPS.

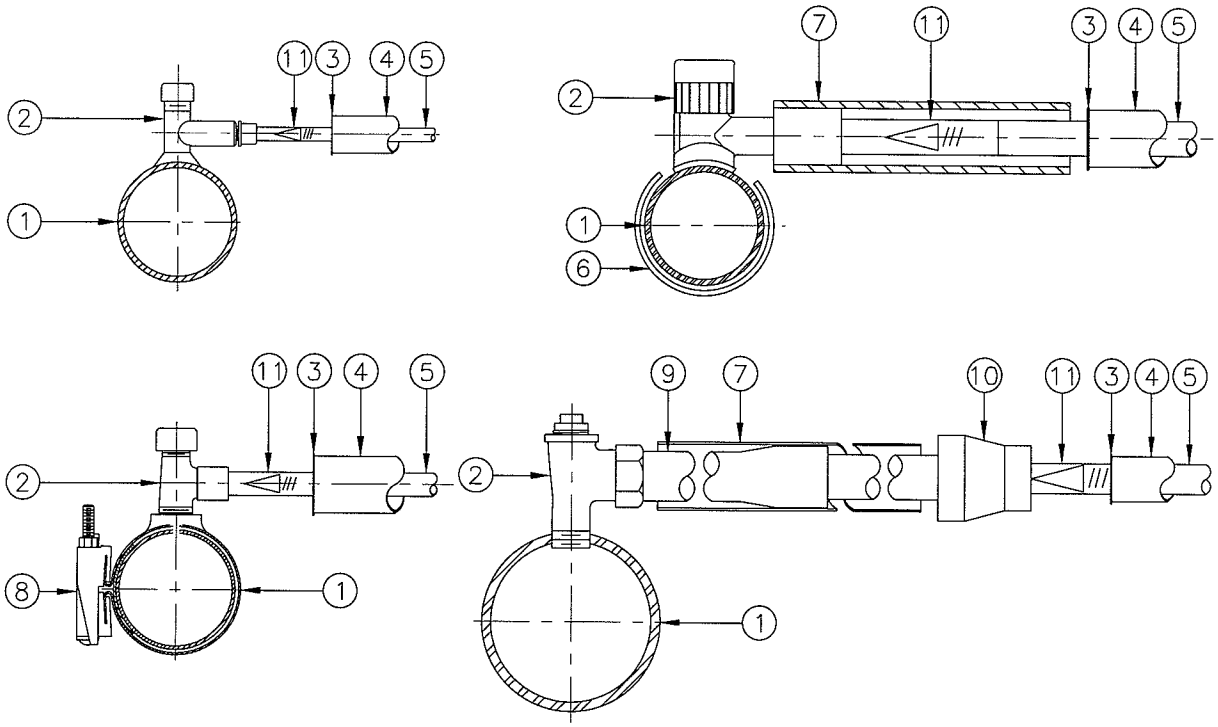
1¼" IPS Plastic should not be inserted in an abandoned service larger than 3" IPS.

2" IPS Plastic should not be inserted in an abandoned service larger than 4" IPS.

4" IPS Plastic should not be inserted in an abandoned service larger than 10" IPS.

NSTAR GAS STANDARDS	SERVICES	C-222-3/6
	SERVICE REPLACEMENT BY PLASTIC INSERT 60 PSIG OR LESS	

FIGURE 2: LOW AND INTERMEDIATE-PRESSURE SERVICE CONNECTION TO CAST IRON, STEEL AND PLASTIC MAINS



① Existing Main

② Inlet Service Connection (Steel or Cast Iron Main M-143, Plastic M-145)

③ End Protector Bushing (M-118)

④ Abandoned Service

⑤ Plastic Pipe (M-252)

⑥ Abandoned Steel or Cast Iron Main

⑦ Protective Sleeve (M-135)

⑧ Mechanical Sleeve (M-150)

⑨ Plastic-to-Steel Transition Fitting (M-135)

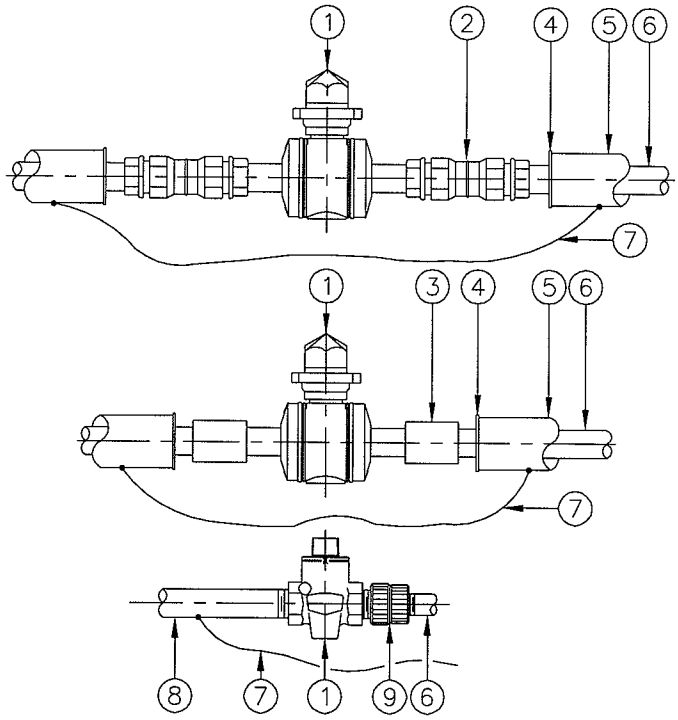
⑩ Fusion Coupling (M-145)

⑪ Excess Flow Valve (M-306)

NOTES

a. Weld, heat-fuse, or thread Inlet Service Connections to Main.
b. Install Inlet Service on Main vertically as shown or anywhere on or above the horizontal pipe centerline as required or depth of cover.
c. Threaded Taps in Cast Iron Pipe are permitted without reinforcement to a size not more than twenty-five percent (25%) of the nominal diameter of the pipe except that 1¼" taps are permitted in 4" Cast Iron pipe. In areas where the soil and service conditions may create unusual external stresses on Cast Iron Pipe. Unreinforced Taps may be used only on 6" diameter or larger pipe. On larger Taps, Mechanical Sleeves shall be used.
d. Protective Sleeves (M-135) are required.
e. Excess Flow Valve required on intermediate pressure services only.

FIGURE 3: INSTALLATION OF LOW AND INTERMEDIATE-PRESSURE OUTSIDE SHUT-OFF FOR PLASTIC SERVICE



① Outside Shut-Off (M-61 or M-51)

② Mechanical Coupling (M-122)

③ Plastic Socket Coupling (M-145) or Electrofusion Coupling (M-140)

④ End Protector Bushing (M-118)

⑤ Abandoned Service

⑥ Plastic Service Pipe (M-252)

⑦ Tracer Wire

⑧ Steel Service Pipe (M-251)

⑨ Plastic Pipe Adapter Fitting (M-146)

NOTES

a. Heat-Fuse Plastic Service Pipe to Valve.
b. Thermit-weld Tracer Wire prior to inserting Plastic Pipe, to avoid damage to Plastic Pipe. See C-592 for Thermit-Weld. Use mechanical clamp if inserted first.
c. Use Pipe Dope Sealant at all threaded metal joints.

FIGURE 4: INSTALLATION OF LOW AND INTERMEDIATE-PRESSURE SERVICES THROUGH BUILDING WALL FOR SERVICE REPLACEMENT BY PLASTIC PIPE

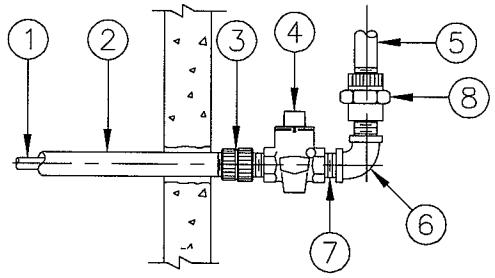


FIGURE 1a: INTERMEDIATE PRESSURE

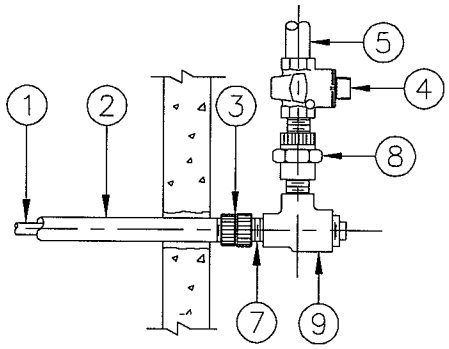


FIGURE 1b: LOW PRESSURE

① Plastic Pipe (Service Inlet) (M-252)

② Abandoned Service

③ Plastic Pipe Adaptor Fitting (Service Head Renewal)(M-146)

④ Inside Shut-Off (M-53)

⑤ Steel Service Pipe (M-251)

⑥ Elbow (M-138)

⑦ Nipple (M-251)

⑧ Insulated Union (M-163)

⑨ Approved Fitting (M-133)

NOTES

a. Use Pipe Dope Sealant at all threaded metal joints.

Information Request PESD-16

Please provide any and all documents substantiating NSTAR Gas Company's compliance with its written procedures related to the establishment of a MAOP for the plastic segment of the service pipeline installed at 65 Main Street, Hopkinton.

Response

The plastic insert for the service pipeline at 65 Main Street was installed in 1974. Please see the Company's response to Information Request PESD-7 for a discussion of the Company's written procedures relating to the establishment of an MAOP at that time.

Information Request PESD-17

Please provide all provisions of NSTAR Gas Company's written procedures that apply to the retention of records in association with corrosion control, leak surveying, and the establishment of an MAOP as required by 49 C.F.R. §§ 603(b) and 605.

Response

Please see the following procedures, which are contained in the Company's currently effective O&M Operating Manual regarding the retention of records associated with corrosion control, leak surveying and the establishment of an MAOP:

(1) Attachment PESD-17(a), Operations and Maintenance Procedure OM-66, Corrosion Control Records;

(2) Attachment PESD-17(b), Operations and Maintenance Procedure OM-60, Records;

(3) Construction Standard C-186 (Testing Gas Mains) at page 3 of 4, Records (provided as Att. PESD-15(b)); and

(4) Construction Standard C-245 (Testing Gas Services) at page 1 of 2 (Item 1.d) and at page 2 of 2 (Item 5.b) (provided as Att. PESD-15(c)).

This procedure pertains to the cathodic protection of steel mains and services.

1. Monitoring Existing Cathodic Protection Systems

Make the following minimum inspections and take action to correct any deficiencies observed.

a. Test every pipeline under cathodic protection once each calendar year and at intervals not exceeding fifteen months. Check that the pipeline cathodic protection is controlled so as not to damage the protective coating of the pipe. Exceptions to this inspection schedule are protected service lines, or a short section of protected main less than 100 feet in length. The latter must be inspected on a sampling basis at least 10% per year with the entire system inspected in each 10 year period.

b. Inspect each rectifier used for cathodic protection or other current source six times each year, at intervals not exceeding 2½ months.

c. Inspect each reverse current switch, diode, and important interference bond electrically six times each year, at intervals not exceeding 2½ months. Check the remaining interference bonds once each calendar year not exceeding intervals of fifteen months.

2. Remedial Measures for Corroded pipe

a. General

Whenever any portion of a buried pipeline is exposed, examine the pipeline for evidence of external corrosion. Take remedial action if corrosion is found. Record examination on Activity Report.

b. Cast Iron and Ductile Iron Pipe

Replace any segment of cast iron or ductile pipe in which general graphitization is found to a degree where fracture or leakage may result.

c. Distribution Lines

Replace with plastic or coated pipe and cathodically protect any section of pipe where the corrosion has reduced wall thickness to less than that required for the maximum allowable operating pressure of the pipeline, or that the remaining wall thickness is less than 30% of the nominal thickness. Repair the pipe if the corrosion area is small. This does not apply to cast or ductile iron pipe. If localized corrosion pitting is observed that may result in leakage, repair immediately or replace section of pipe.

3. Internal Corrosion Control

a. After July 31, 1972, corrosive gas may not be transported by pipeline, unless the corrosive effect of the gas on the pipeline has been investigated and steps have been taken to minimize internal corrosion.

b. Whenever any pipe is removed from a pipeline for any reason, inspect the internal surface for any evidence of corrosion. If internal corrosion is found, then investigate the adjacent pipe to determine the extent of internal corrosion. Take steps to minimize this internal corrosion by replacing the pipe, modifying the fluid or pipe surface.

4. Remedial Measures for Corroded pipe

General

Pipelines installed after July 31, 1971, that are or have any portion exposed to the atmosphere will be cleaned and either coated or jacketed with a material suitable for the prevention of atmospheric corrosion. Although the operator need not comply with this requirement if he can demonstrate by test, investigation or experience in the area of application, that a corrosive atmosphere does not exist, it is suggested that coating be undertaken.

For pipelines installed after August 1, 1971, that are or have any portion exposed to the atmosphere, the operator must determine the areas of atmospheric corrosion on the pipeline. If atmospheric corrosion is found, apply remedial measure. These areas of atmospheric corrosion on the pipeline must be cleaned to bright metal, and coated or jacketed with a material suitable for the prevention of atmospheric corrosion.

Monitoring

After meeting the requirements of General above, the operator shall, at intervals not exceeding three (3) years for onshore pipelines, reevaluate each pipeline that is exposed to the atmosphere and take remedial action whenever necessary to maintain protection against atmospheric corrosion.

5. Corrosion Control Records

General

Records and maps shall be maintained to show the location of cathodically protected piping, cathodic protection facilities, or other than unrecorded galvanic anodes installed before August 1, 1971 - and neighboring structures bonded to the cathodic protection system. These records shall be retained for as long as the pipeline remains in service. Also, the records of each test, survey, or inspection are required, in sufficient detail, to demonstrate the adequacy of corrosion control measures or that a corrosive condition does not exist.

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Approved		Revised		Revised		Revised		Revised	
Date	By	Date	By	Date	By	Date	By	Date	By

1. GENERAL

The following is the established procedure for leakage surveys, leak classification, action criteria, and reporting. When evaluating any gas leak, the initial step is to determine the perimeter of the leak area. When the perimeter extends to a building wall, the investigation will continue into the building.

2. DEFINITION OF TERMS

a. **Building:** Any structure, which is normally or occasionally entered by humans for business, residential or other purposes, and in which gas could accumulate.

b. **Building of Public Assembly:** A building where persons would gather for a public event. These buildings would include schools, churches, hospitals, theaters, etc.

c. **Business District:** Areas with wall-to-wall paving and/or where the principal commercial activity of the city or town takes place.

d. **Class Locations:** An area defined and classified by set criteria included in D.O.T. Pipeline Safety Regulations, CFR Title 49 part 192.5.

e. **Combustible Material:** A flammable gaseous material consisting of organic compounds such as methane, benzene, etc.

f. **Confined Space:** A confined space means any space which has a limited means of access and egress, has adequate size and configuration for employee entry, is not designed for continuous employee occupancy and where the atmosphere may be deficient in oxygen content or is subject to the accumulation of toxic or flammable contaminants.

g. **Distribution Main:** A line that serves as a common source of gas supply for more than one service line.

h. **Gas Detector:** An instrument capable of detecting and measuring the percentage concentration of combustible gas in air.

i **Gas Facilities:** All company operated gas lines and related appurtenances.

j. **Leak:** The unintentional escape of gas from containment.

k. **Leak Classifications:**

(1) Class 1 Leak - A leak which represents an existing hazard to persons or property requiring immediate repair or continuous action until conditions are no longer hazardous.
(2) Class 2 Leak - A leak, which is recognized as being non-hazardous at the time of detection, but requires periodic monitoring based on possible future hazard.
(3) Class 3 Leak - A leak that is non-hazardous at the time of detection and can be reasonably expected to remain non-hazardous.

l. **Leak Survey:** A search for possible gas leakage in any area where gas facilities exist, or where a gas leak is reported or suspected.

m. **LEL:** The lower explosive limit, as indicated on a combustible gas indicator, expressed as a percentage of gas in air.

n. **Reading:** A repeated measure of gas indicated on a gas detector. Where the reading is in a confined space, consideration should be given to the rate of dissipation when the space is opened or ventilated for the test and the rate of accumulation when the space is closed.

o. **Service Line:** A distribution line which transports gas from a common source of supply to a customer meter.

p. **Station Piping:** For the purposes of leak surveying, this includes all underground gas pipes and appurtenances within the property lines of regulator stations and other gas operating installations.

q. **Substructure:** Any man-made structure, tunnel, passageway, or other confined space below ground level where gas could accumulate.

3. PRIORITIES

a. Surveillance and repair activities shall be based on such factors as:

(1) The volume, gas-air concentration, and source of the escaping gas.
(2) The size and occupancy of the area where the leakage could occur, and the proximity to structures both above and below ground.
(3) The presence of any substructure or other underground facility that could affect the migration or accumulation of gas.
(4) Soil or surface conditions that could affect the migration of gas.
(5) The proximity to sources of ignition.
(6) Public awareness and reaction to the leak situation.
(7) Soil movement caused by landslides, earthquakes, etc., where external stresses on the pipeline may cause leakage.

3. PRIORITIES

b. After consideration of the above factors, repair priority will be in the order of Class 1, Class 2, and Class 3.

4. LEAK CLASSIFICATION AND ACTION CRITERIA

The following examples of leak conditions and possible action are to be used as guidelines and are not exclusive.

The judgement of company personnel at the scene is of primary importance in determining the classification of a leak and the action to be taken.

a. **Class 1 - Classification**

(1) Any leak which, in the judgement of company personnel at the scene, is regarded as an immediate hazard.
(2) Any indication of gas, which has migrated into or under a building or structure.
(3) Any reading below ground or which has emanated from below ground at the outside wall of a building.
(4) Escaping gas, which has ignited.
(5) Any reading of 80% LEL, or greater, in a confined space.
(6) Any reading of 80% LEL, or greater, in a non-gas substructure from which gas would likely migrate to the outside wall of a building.
(7) Any reading of 40% LEL, or greater, under a sidewalk which extends to a building wall in wall-to-wall paved area.

b. **Class 1 - Action Criteria**

Take immediate and continuous action until the hazard no longer exists. Such action may include (but is not limited to or restricted to the order in which they are listed) one or more of the following:

(1) All identified conditions of a hazardous nature to persons or property shall be promptly made safe and permanent repairs instituted.
(2) Evacuate the premises and notify the area Manager or Director of the situation.
(3) Vent the leakage.
(4) Remove sources of ignition.
(5) If burning, prevent the spread of the fire but not necessarily extinguishing burning gas.
(6) Eliminate the source of gas by closing valves or other means.
(7) Restrict public access into the area, including rerouting traffic.

(8) Notify police and fire departments.
(9) If the hazard cannot be rectified, refer to OM-62.

c. **Class 2 - Classification**

(1) Any leak which, in the judgement of company personnel at the scene, is of sufficient magnitude to justify periodic monitoring.
(2) Any leak which, under frozen or other adverse soil conditions, would likely migrate to the outside of a building wall.
(3) Any leak under the street of a wall-to-wall paved area that has a substantial enough spread to indicate the possibility of migrating to the outside wall of a building.
(4) Any reading between 20% LEL and 80% LEL in a confined space.
(5) Any reading between 20% LEL and 80% LEL in a non-gas substructure.
(6) Any reading on a pipeline operating at 20% SMYS, or greater, in a Class 3 or 4 location.

d. **Class 2 - Action Criteria**

Monitor on a periodic basis, the frequency depending on the location and magnitude of the leak. Schedule repair as necessary.

e. **Class 3 - Classification**

All other leaks which are determined to be non-hazardous at the time of detection and can be expected to remain non-hazardous.

f. **Class 3 - Action Criteria**

Reevaluate during next scheduled survey or until leak is reclassified or no longer results in a reading.

5. FREQUENCY OF PERIODIC LEAK SURVEYS

a. **Monthly Survey**

In accordance with the Massachusetts Department of Telecommunications and Energy Order 93-199, dated March 29, 1994, a leak survey of the high pressure pipeline to the Massachusetts Institute of Technology (Third Street to Albany Street, Cambridge) must be conducted monthly.

b. **Quarterly Survey**

Mains in place or on structures where anticipated movement or external loading could cause failure or leakage will be surveyed at intervals not exceeding 4½ months, but at least four times per calendar year [Ref. 192.72 1 (b)].

During these surveys observations will be made of surface conditions on and adjacent to the pipeline right-of-way for indications of leaks, construction activity, and other factors which may affect safety and operation.

c. **Annual Survey**

(1) Business district - A gas detector survey will be conducted at intervals not exceeding one year in business districts including tests of the atmosphere in gas, electric, telephone, sewer, and water system manholes, at cracks in pavement and sidewalks, boxes including gas boxes, and at other locations providing an opportunity for finding gas leaks.

In areas where effectively prescribed and supervised surveys of manholes (electric, telephone, etc.) and vaults is conducted and offers more frequent coverage. Such a survey procedure may be substituted.

The business districts shall be outlined on a map. The map shall be revised as conditions warrant. [Ref. 192.723 (b)(I) ; 220 CMR 101.06 (21)(a)]

(2) Buildings of Public Assembly - A survey will be conducted at least once annually and shall include tests for gas leakage and visual inspection of gas facilities in the immediate area of the service entrance. [Ref. 220 CMR 101.06 (21)(d)]

(3) Mains Operating At A Hoop Stress of 20% SMYS - Leakage surveys of mains operating at a hoop stress at or above 20% SMYS shall be made at intervals not exceeding 15 months, but at least once each calendar year. [Ref. 192.706 (b)]

The following is a list of mains with a hoop stress of 20% SMYS or greater at MAOP:

CAMBRIDGE

(a) J-2 Lateral, McGrath Hwy, Somerville to Third St., Cambridge

MAOP: 329 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 219 p.s.i.g

HOPCO

(a) LNG plant to Wilson Street meter station, Hopkinton

MAOP: 1000 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 445 p.s.i.g

(b) Marathon Station, inlet side

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 611 p.s.i.g

(c) TGP inlet to Marathon Station

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 462 p.s.i.g

(d) TGP/AGT Marathon Station outlet to Wilson Street meter station, Hopkinton

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 462 p.s.i.g

(e) AGT inlet to Marathon Station

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 611 p.s.i.g

(f) Marathon Station, to LNG plant

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 710 p.s.i.g

SOUTHBORO/WORCESTER

(a) Hopkinton-Ashland Transfer Line, Wilson Street, Hopkinton to Pond St. Ashland

MAOP: 800 p.s.i.g

Operating pressure equivalent to a hoop stress of 20% SMYS: 611 p.s.i.g

d. Every Two Years

(1) Areas not included in business districts. [Ref. 220 CMR 101.06 (21)(b)].
(2) Service stubs shall be identified and a leakage survey made at least once every consecutive twenty-four (24) month period using a gas detector system, such as flame ionization equipment or equivalent devices. [Ref. 220 CMR 107.07 (2)]

e. Every Three Years

Cathodically unprotected metallic distribution lines, which are located outside business districts and are subject to D.O.T. Pipeline Safety Regulations part 192.465(e) on which electrical surveys are impractical.

f. Every Five Years

All other service lines not covered in Section 5, Items a to e, will be surveyed at intervals not exceeding five years. This survey will include 20% of the service lines each year. Persons participating in leakage surveys shall be trained to recognize the possible existence of locations of unknown or unidentified leaking inactive service lines that may be found during the survey. (This will also apply to item 4 above.) [Ref. 220 CMR 107.07 (1)]

g. Additional Leak Surveys

The following is to be used as a guide for conducting additional leak surveys as frequently as experience and technology indicate necessary:

(1) Surveys during winter months when frost heave could result in leakage.
(2) Yearly survey in lieu of two year survey of entire distribution system in addition to the principal business districts. This survey may be performed at a faster rate than the two year survey. It may involve driving in the normal traffic lanes on both sides of the street.
(3) Survey of commercial buildings to include tests for gas leakage and visual inspection of gas facilities in the immediate area of the service entrance.

(4) Manhole surveys outside the business district.
(5) Interim patrols to locate leaks after or during outside construction in the area of gas lines, prior to street resurfacing, and as a result of past leak history or corrosion information.
(6) Pipeline patrols - Refer to OM-78.

6. LEAK SURVEY METHODS

a. The method used for leakage surveys shall include one or more of the following:
   (1) Gas detector survey using combustible gas indicators
   (2) Flame ionization equipment
   (3) Infrared equipment
   (4) Other industry accepted and proved equipment

b. When conducting scheduled surveys the following guidelines will be observed unless otherwise directed:

   (1) Mobile surveys will be performed with a mobile unit at a speed of not more than 5 MPH. The detection instrument will be set on the low scale (0-10 PPM). The survey will be conducted on both sides of the street wherever possible.
   (2) Walking surveys will be performed using a portable flame ionization unit, or other industry accepted equipment, walking in the sidewalk area parallel to the main and along the foundation of the building, and crisscrossing the land between the main and the structure. In the case of a vacant lot, the same pattern will be followed using common sense to establish a bound area. The probe of the instrument will be held as close to the ground as possible while walking. This survey shall encompass all buildings and lots on a given street unless otherwise noted.
   (3) Building surveys will include tests for gas leakage and visual inspection of the gas facilities in the immediate area of the service entrance. Tests will be conducted with a combustible gas indicator or other industry accepted equipment.
   (4) Bridge and other exposed pipe surveys will be performed by walking the designated areas using a portable flame ionization unit or other industry accepted equipment. While conducting the survey the detection probe will be placed as close to the pipe as possible.
   (5) Surveys conducted in a principal business district will involve the testing of the atmosphere in available street openings including electric, telephone, sewer, drain, and water system manholes, catch basins, at cracks in pavement and sidewalks, boxes including gas boxes, and at other locations providing the opportunity for finding gas leaks. These tests will be performed using a combustible gas indicator, flame ionization equipment, or other industry accepted equipment.

(6) Outside surveys will not be performed during wind or weather conditions, which would adversely affect the ability of the survey unit to accurately detect the presence of leaks.
(7) When the person conducting a scheduled survey detects any leak determined to be potentially hazardous and classified as a Class I, they will immediately notify the appropriate personnel and remain at the location of the leak. This person will continue to pinpoint the source of the leak until properly relieved by a supervisor.

7. FOLLOW-UP INSPECTION

The adequacy of leak repairs will be checked before backfilling. The perimeter of the leak area will be checked with a combustible gas indicator. Where there is residual gas in the ground after the repair of a Class 1 leak, a follow-up inspection will be made as soon as practical after allowing the soil atmosphere to vent and stabilize, but in no case later than one month following the repair. In the case of other leak repairs, the need for a follow-up inspection will be determined by qualified personnel.

In order to facilitate a follow-up inspection, the amount of residual gas from a Class I leak must be recorded on the reverse side of Leakage Control Report OD 374.

8. RECORDS

a. Leak survey records for mains operating at or above 20% SMYS must be kept as long as the segment involved remains in service. [Ref. 192.709]

b. All other leak survey records identified in this operating and maintenance plan must be kept on file for a period of time not less than the interval between successive surveys. [Ref. 220 CMR 101.06 (21)(f)]

c. Each leak survey record shall include sufficient information to determine the following at a later date:

(1) The type of survey and date it was conducted.
(2) The personnel conducting the survey and whom they represent.
(3) The area or buildings surveyed.
(4) Location of all leak indications found.

d. In the event of a leak, the person conducting the survey will complete Leakage Control Report OD 374. In addition to the above information the following will be recorded:

(1) The method of survey.
(2) The percent of gas or LEL.
(3) The leak classification.
(4) A sketch providing the location of the underground leak or a detailed description of an above ground leak.
(5) Time reported (Class 1).

e. Leak repair records on all lines will be kept on file for as long as each segment remains in service. Each leak repair record will include:

(1) Information required on the reverse side of Leakage Control Report OD 374 (see attached).
(2) Person responsible for repair.
(3) A sketch of the exact location of the repair and any other pertinent information regarding underground leaks.
(4) Description of repairs made on above ground leaks.
(5) Method used to repair the leak.
(6) Percentage of residual gas after the repair of a Class I leak.

9. OTHER COMBUSTIBLE MATERIAL IN SOIL

If the source of the gas leak can not be found after a thorough investigation by a Leak Surveyor or by a Distribution Crew, one potential cause that must be considered is the presence of other combustible material in the soil.

Once it has been determined the source of the combustible material in the soil is not from our facility, the appropriate public safety office will be notified.

Information Request PESD-18

Please support NSTAR Gas Company's statement in its response to the NOPV, D.T.E. 03-PL-19 that federal regulations do not require the retention of pressure test records for service pipelines, including the plastic segment of the service pipeline installed at 65 Main Street, Hopkinton.

Response

In the NOPV, the Department alleged that NSTAR Gas violated 49 C.F.R. § 192.619, which requires MAOP testing prior to the operation of plastic pipelines. This regulation, however, has no recordkeeping requirements.

In fact, there was no recordkeeping requirement for MAOP testing in place at the federal or state level in 1974. Moreover, even the current regulation set forth at 49 C.F.R. § 192.517 requires that MAOP testing information be retained for only 5 years. Accordingly, even if that regulation had been in effect at the time of the installation (which it was not), NSTAR Gas would still be under no obligation to maintain MAOP records for all of its services indefinitely. Please also see the response to Information Request PESD-7.

Information Request PESD-19

Please support NSTAR Gas Company's statement in its response to the NOPV, D.T.E. 03-PL-19 that atmospheric corrosion monitoring and control are not applicable to interior segments of service pipelines.

Response

The plain language of 49 CFR § 192.479(a) states:

> (a) *Pipelines installed after July 31, 1971.* Each aboveground pipeline or portion of a pipeline installed after July 31, 1971 that is exposed to the atmosphere must be cleaned and either coated or jacketed with a material suitable for the prevention of atmospheric corrosion. *An operator need not comply with this paragraph, if the operator can demonstrate by test, investigation, or experience in the area of application, that the corrosive atmosphere does not exist.*

The Company's response sets forth a detailed explanation as to the reasons that there is no requirement to perform "atmospheric corrosion" monitoring on underground service lines running into residential dwellings. See Attachment PESD-9, at pages 16-20. Aside from the fact that the Company's approach is consistent with industry practice, the Company's experience has shown that service lines located *inside* of residential buildings are not generally susceptible to "atmospheric corrosion," which in the industry is generally recognized as the type of corrosion that occurs when pipeline is located outside and is subject to extreme weather conditions such as snow, rain, road salt and similar factors.

Please also see the responses to Information Requests PESD-4 and PESD-12.

Information Request PESD-20

Please provide all statements or testimony by NSTAR Gas Company personnel, representatives, or contractor personnel in support of NSTAR Gas Company's reply to the NOPV, D.T.E. 03-PL-19.

Response

The Company's response to the NOPV was developed through informal meetings between legal counsel and NSTAR Gas staff. All material documentation relied upon by the Company to develop the response to the NOPV was provided as attachments to that document in order to facilitate the Department's review of the Company's filing (see Attachment PESD-9).